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THE Association was organized in Boston, Mass., on June 21, 1882, with the object of providing its members with means of social intercourse and for the exchange of knowledge pertaining to the construction and management of water works. From an original membership of only TWENTY-SEVEN, its growth has prospered until now it includes the names of 900 men. Its membership is divided into six classes, viz.:

A Member shall be an officer or employee of a public or private water works, an engineer, chemist or other person qualified to aid or interested in the advancement of knowledge relative to water works.

An Honorary Member shall be a person of acknowledged eminence in some branch of water supply or of engineering.

A Junior shall be not less than eighteen years nor more than twenty-five years of age, a student or connected with water supply work.

An Associate shall be either a person, firm or corporation engaged in manufacturing or furnishing materials or supplies for the construction or maintenance of water works.

A Corporate Member shall be either a Water Board, Commission, Company or Municipal Corporation.

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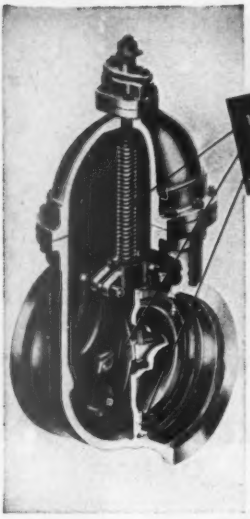

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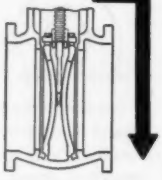

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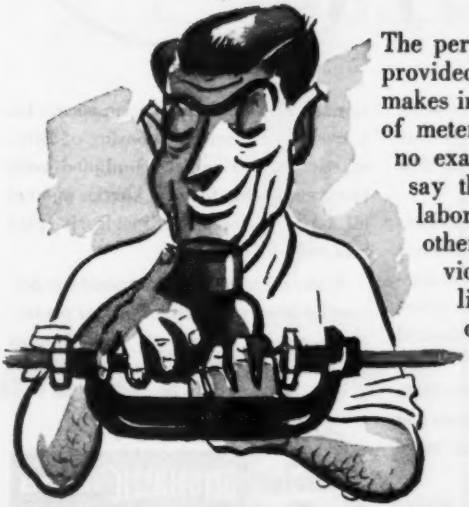

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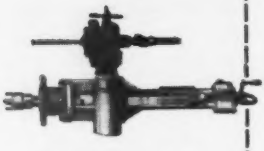

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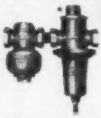

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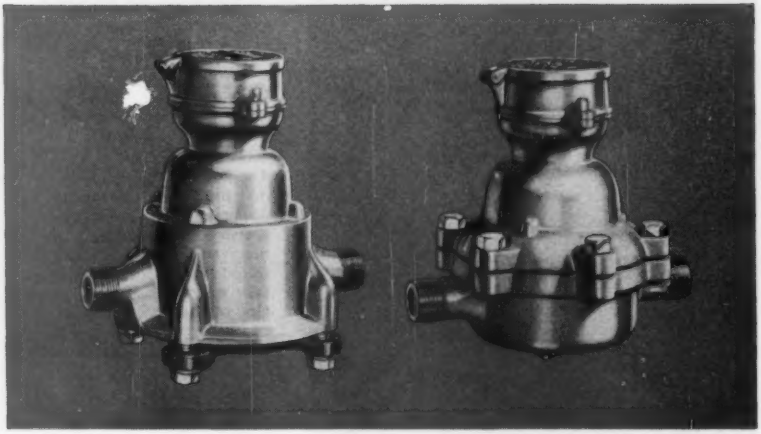

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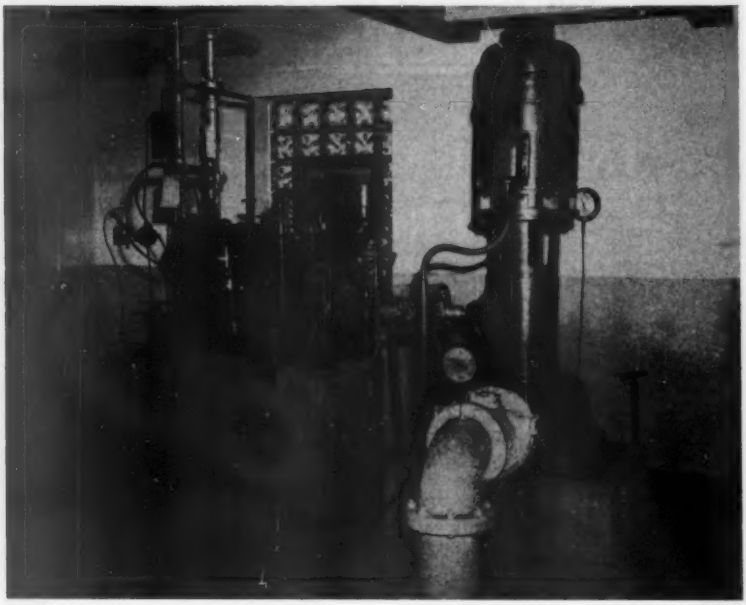

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New England Water Works Association
ORGANIZED 1882

VOL. LXVI DECEMBER, 1952 No. 4

This Association, as a body, is not responsible for the statements or opinions of any of its members

BRIDGE CROSSINGS

BY GEORGE A. HOWLAND, III*

[*Read January 17, 1952.*]

In nearly every water system there is occasion to carry supply or distribution mains across streams, requiring determination of the relative advantages of laying the pipe in the stream bed or supporting it on a bridge.

Sometimes one method, sometimes the other will be more advantageous. Similar problems also arise in connection with railroad crossings. It is the purpose of this paper to discuss only some of the features requiring consideration in the case of pipes carried on bridges.

The matters requiring attention include the method of attachment and support, the need for flexibility because of vibration and temperature changes, provision for resisting thrust at abrupt angles, and the problem of insulation.

Attachment and support will differ in almost every case. The bridge is usually an existing one and the design seldom provides specifically for future pipes. It is necessary to select a location for the pipe and to devise a method of supporting it which will be appropriate to the structural design of the particular bridge and will avoid interference with utilities already installed in the structure. Sometimes space can be found between girders or trusses beneath the bridge floor, but diagonal braces or other structural features are apt to prevent the use of this method. More often it is necessary to carry the pipe on hangers or brackets outside the principal bridge members.

Vibration under traffic or wind pressure is often present in bridges to an extent which is excessive for rigid pipes and unyielding joints. Advantage should be taken of some of the numerous standard types of flexible mechanical joints to permit articulation without leakage.

*Assistant Engineer, Metcalf & Eddy, 20 Providence St., Boston 16, Mass.

In some cases deflection may be sufficient to require the use of steel pipe, to provide flexibility not available with more brittle materials.

In long crossings, particularly on bridges which are designed with expansion joints at specific locations, it is necessary to make provisions for expansion and contraction beyond the capacity of the ordinary mechanical joint. This can be done by introducing special expansion joints which provide the necessary travel. In determining the details, consideration should be given not only to the changes in pipe length under extremes of temperature, but also to the relative movement of bridge and pipe. The length of the bridge may change more than that of the pipe, because of differences in the temperature range due to the water content of the pipe. The pipe must be anchored in a manner which will assure that major movement from expansion or contraction will occur in the expansion joint and not in other joints unable to take it safely.

Near the bridge abutments, where the pipe leaves the ground and enters the bridge structure, there frequently will be abrupt changes in direction, requiring careful anchorage of pipe and fittings against thrust from water pressure. This will usually be accomplished by the design of appropriate harnesses, which may often be combined with the brackets or other supports at the ends of the span. Care must also be taken to provide for the transition from rigidity to flexibility near the abutments.

The need for insulation against freezing will depend upon climate, the length and size of the crossing, and the continuity of circulation in the pipe. In cold climates protection is desirable, except for pipes in which substantial rates of flow are always present or where the exposed pipe is relatively short and sheltered. Many methods of insulation have been employed, varying from the commercial types, manufactured for the purpose, to improvised wood or metal enclosures, filled with sawdust, cork and the like or relying on the dead air space between pipe and enclosure. In extreme cases a steam pipe, carried adjacent to the water pipe, has been used to supplement the insulation. It is well known that it is important to keep the insulating material dry, because saturation destroys the insulating properties.

Brief descriptions of a few typical cases may serve to illustrate the manner in which pipes have been adapted to certain bridges.

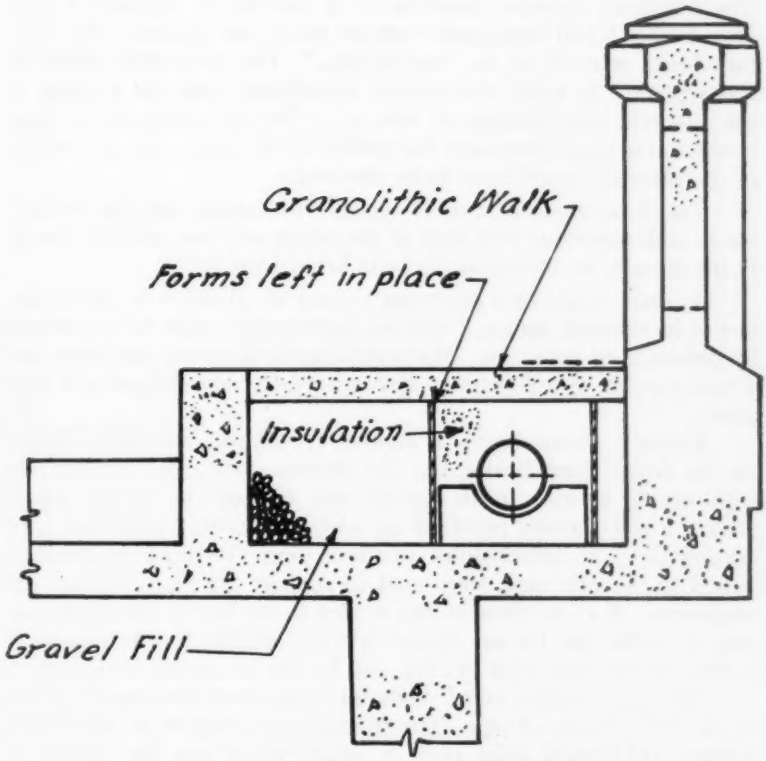


FIG. 1.—CHILDS RIVER BRIDGE—8-IN. WATER-PIPE CROSSING.

Figure 1 illustrates an 8-in. water main crossing the Childs River Bridge in Falmouth, Mass. The plans of the bridge indicated a gravel-filled space below the granolithic sidewalk, which afforded sufficient space between the structural slab and the sidewalk slab for the 8-in. water main and its insulation.

As only two lengths of pipe were required, there is just one joint on the bridge itself. The pipe was set on wooden saddles to permit an equal amount of insulation above and below. Wooden forms were used as a mold and also to confine the insulation when it was placed.

The insulation material consisted of a mixture of granulated cork (two bushels) and high-grade coal-tar pitch (six gallons), this mixture being referred to as "crackerjack." The granolithic sidewalk was replaced, to equal the original installation, and the jointing in the sidewalk was planned so that, if it became necessary to gain access to the single joint near the middle of the span, only one section of the sidewalk would have to be removed.

For the approaches, two 45° bends with hooked lugs for anchoring in both directions were used at the bridge and two plain 45° bends in the ground, to connect to the main below frost line.

As there would be a minimum amount of vibration in the bridge, due to its size and design, it was not necessary to allow for movement by deflection or expansion. Mechanical joints were not necessary and it was possible to use ordinary bell-and-spigot, cement-lined cast-iron pipe.

Figure 2 shows details of another crossing in Falmouth, Mass., on the Great Pond Bridge. As the picture shows, the existing pile caps of the wooden trestle extend well beyond the bridge superstructure and thereby provided an adequate starting point for supporting the 8-in. cement-lined cast-iron pipe. Twelve-inch I-beams, bolted to the pile caps, were used to support the pipe between the abutments. A 15-in. channel was welded to the top of the beam, not only to stiffen the I-beam against lateral buckling, but also to form a floor for the pipe, pipe saddles, and boxing to contain insulation.

The wood saddles and U-bolts were placed at the quarter points of the 18-ft lengths of pipe. The crossing was designed to use Standardized Mechanical Joint pipe or equal, which has the ability to articulate without leakage under movement or vibration. The pipe saddles were of dimensions suitable for the attachment of the box which, together with the 15-in. channel, surrounds the pipe and holds the granulated cork, which was used here also as the insulating material.

Forty-five-degree bends of the Standardized Mechanical Joint type with hooked lugs were used at the abutments and 45° bends of the bell-and-spigot type with lugs were used in the ground. The lugs were cast on for anchoring in both directions, so that the entire pipe as it rises to the bridge and then runs horizontally is securely anchored.

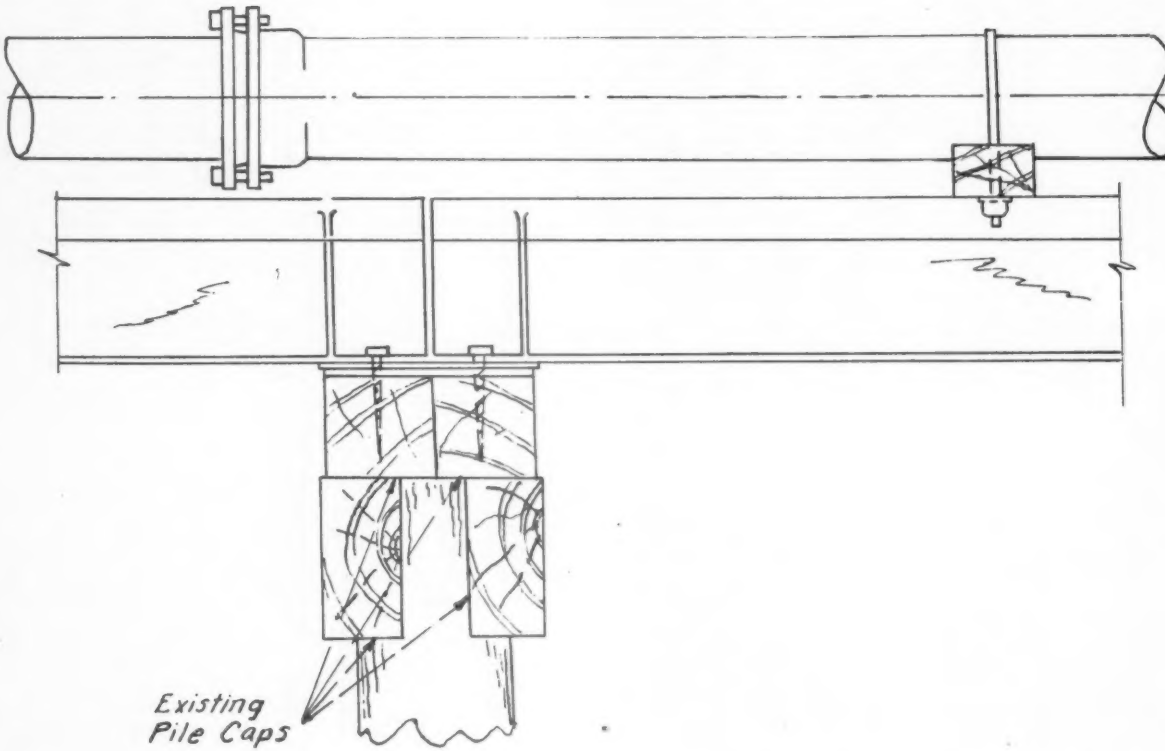
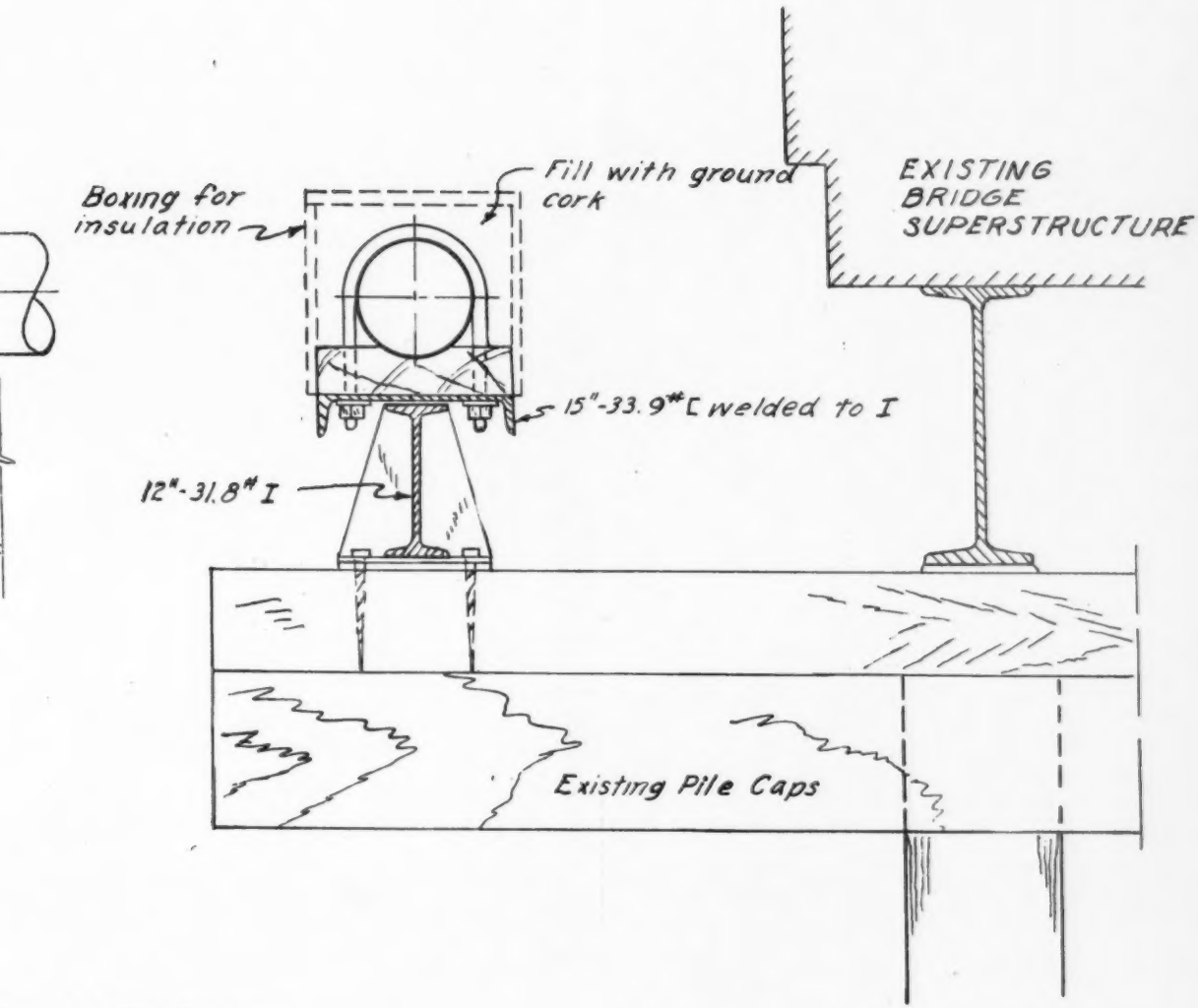


FIG. 2.—GREAT POND BRIDGE



Bridge—8-in. Water-Pipe Crossing.

Beyond the downward bend at the bridge there is a U-bolt, which ties into the side of the abutment to prevent any lateral movement above the ground.

On this type of crossing, where channels and beams spanning the bridge are used to support the pipe, their size is determined not by the load, which is relatively small, but rather for the purpose of limiting deflection, which might shatter pipe of brittle types.

Figure 3 indicates the detail at both ends of a crossing to be made at a highway overpass of the St. Johnsbury - Lake Champlain R.R. in the outskirts of St. Johnsbury, Vt. This 8-in. water main also crosses a nearby bridge, spanning Sleeper's River, and the same methods are used in the design of both installations. Both of these bridges are of the reinforced-concrete type. The railroad overpass has a single span from abutment to abutment, and the river bridge has three spans supported on the abutments and two intermediate piers. Neither of the bridges offers any means of supporting the pipe in either of the two previously-mentioned manners; space limitations and structural details of the parapets made it necessary to design special short brackets, from which standard pipe hangers will be suspended to carry the pipe. These hangers will be bolted firmly around the pipe and hang by an eye nut outside the insulation, and will allow the pipe to move without disturbing the insulation. These hangers at each end of the bridges, and at intervals between, will be tied by horizontal struts to the bridge structure, to prevent side sway.

The connections from the ground to the bridge are to be made by the use of "Universal" pipe, which in this case makes adequate provision for thrust and flexibility also. "Dresser" couplings will be used to connect the 18-ft lengths of the pipe on the bridge itself. As extreme temperatures are common in northern Vermont, expansion will be provided for by leaving a 1-inch space between the ends of adjoining lengths of pipe when the couplings are installed. Each coupling is expected to accommodate $\frac{3}{8}$-in. expansion without leakage and excessive wear on the gasket.

In these two crossings the design had to include very thorough insulation, because the water main is on the outskirts of town and during the late part of the evening and the early morning hours the flow through the pipe will be very slight, if any. For this purpose it

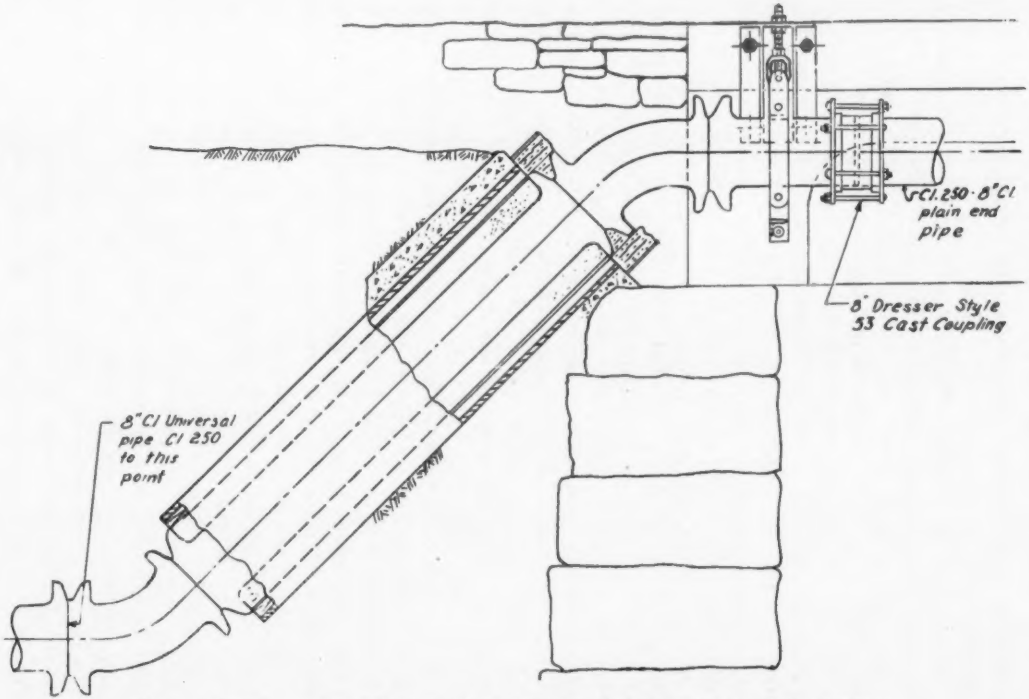


FIG. 3.—DETAIL FOR BOTH ENDS OF ST. JOHNSBURY - LAKE CHAMPLAIN R.R. CROSSING.

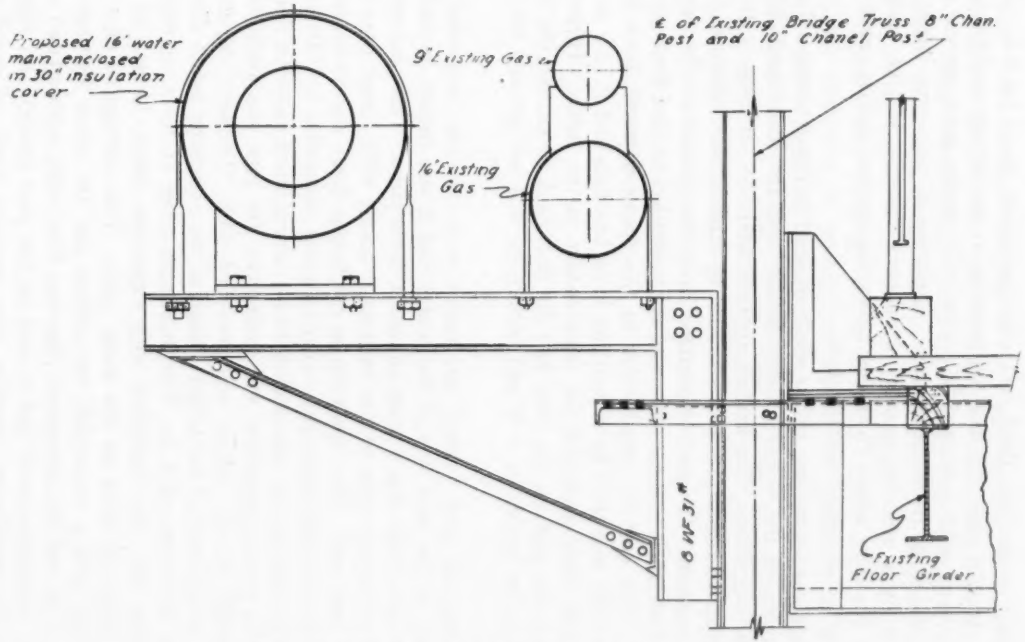

Proposed 16' water main enclosed in 30" insulation cover
9" Existing Gas
16" Existing Gas
℄ of Existing Bridge Truss 8" Chan. Post and 10" Chanel Post
Existing Floor Girder

FIG. 4.—16-IN. RIVER CROSSING ON UPPER COUNTY BRIDGE.

is planned to use 3-in. thick rock cork insulation, made for 8-in. pipe, on the straight runs and hair-felt material at the fittings and hangers, both covered with a watertight jacket. To render good service and to be assured of its watertightness, insulation of this type should be installed by a qualified person. This same material will be used to protect the pipe above frost line below the ground and is protected from rot by an outer metal jacket.

Figure 4 shows in part the methods used in constructing a 16-in. water main on the Upper County Bridge over the Merrimack River at Haverhill, Mass. The bridge, approximately 850 ft long, is of the pin-connected truss type and is subject to considerable vibration from heavy trucking. It was first planned, with the consent of the proper authorities, to locate the pipe and its insulation on the floor of the bridge. The cost of construction in this location would have been considerably less than by supporting it on brackets and it also would have been more accessible for maintenance in the future. However, to locate the pipe on the floor had the drawback of cutting the road width on the bridge by 4 ft and permission was not granted for this location.

Nine-inch and 16-inch gas mains were already supported by brackets on the west side of the bridge and it was finally decided to lay the new 16-in. water main alongside these pipes. This plan necessitated replacing some of the existing brackets with larger ones and adding new ones. The pipe used on the bridge itself was 16-in. seamless steel pipe with bituminous enamel lining, connected by "Dresser" couplings, and for the approaches 16-in. cement-lined cast-iron flanged pipe. To permit expansion and contraction the pipe was anchored in the middle of the bridge and provided with "Dresser" expansion joints at each end of the bridge. Each of the expansion joints allowed a total movement of 4 in. The insulation cover of 30-in. corrugated iron pipe was also furnished with expansion joints, located at the same points as those on the water main. This corrugated pipe was furnished with a removable top section and the space between the water main and the corrugated pipe was filled with regranulated cork. As the insulation cover had to rest on the pipe cradles and support the whole installation, interior pipe supports made of wood were required between the corrugated pipe and the 16-in. steel pipe. The

new pipe brackets were designed to carry not only the water main and its insulation, but also the two existing gas mains, which were left in service during construction. Both approaches were anchored against movement with reinforced-concrete blocks, carried from undisturbed material in the trench to the bend on the bridge.

No two bridge crossings will be identical. There is always opportunity for ingenuity in working out details of construction without hazard to the structural integrity of the bridge or of the pipe, and for tact and understanding in dealing with the bridge authority whose approval must be obtained for attachment of pipe and supports. Modern bridges often make general provision for future utilities and water-works officials should request such provision whenever new bridges are about to be designed for construction in localities where pipes are likely to be wanted

PROGRESS IN SOLVING SUPPLY AND DISTRIBUTION PROBLEMS AT NEWTON, MASSACHUSETTS

BY MARK F. CROKER*

[*Read September 8, 1952.*]

In preparation of the preliminary outline of a paper covering a subject which includes the word "progress", it is obviously necessary to consider the basic value of the information to be presented in relation to, and supplementary of, previous reports of a similar nature, covering past periods of development in the subject municipal water-supply and distribution system. Comprehensive papers on progress, improvements and planned procedures, together with an account of related engineering problems and an historical outline of the development of the Newton Water Supply were read before this association on January 10, 1934, by Richard H. Ellis and George A. Sampson, Water Commissioner and Consultant, respectively. Accordingly, except for a brief description of distribution-system development prior to the above-mentioned date, the author plans to base the subject matter of this progress report upon the subsequent period of 1934-1952. Initially, the listener or the reader might well form the opinion that the author, in covering a period of over 18 years, is delving back into ancient history for material upon which to build his report. It may well be pointed out, however, that the true value of a paper of this type lies in its development as a well-rounded picture of progress in anticipating and meeting basic requirements of supply and distribution in a municipality which has expanded greatly in respect to water demand during a portion of the period covered herein. Statistics, while a necessary adjunct to other material on a subject of this nature, in the interests of easy readability will be kept to an essential minimum.

The City

Newton is a city, essentially residential in character, located west of Boston, with its geographical center approximately 8 miles from

*Commissioner, Water Department, Newton, Mass.

the State House. Encompassed within its boundaries is an area of about 18 sq mi, with approximately 290 miles of streets, upon which are located some 19,000 houses, sheltering a population of approximately 85,000 people. The city has 11 separate villages, each having its own identity and characteristics, the whole being serviced by 10 post offices, 11 fire stations and 12 railroad stations. Current assessed property valuation is close to $219,000,000, making Newton the fourth largest city in Massachusetts, from the standpoint of real value. In addition, exempted property valuation totals $44,369,000 or 20.26% of the assessed figure, a sizeable item. It is interesting to note that while the economic level of Newton home owners is above average in relation to most suburban municipalities, yet extremes in living standards most certainly exist within the community. This may be rather illuminatingly typified by an interesting detail of housing construction which occurred recently. On the one hand, an 8-room single-family home was built at a cost of $147,000 above the land and, on the other, one of two rooms totalling only $800 above the land. One estate covers an area of almost 250 acres, including a deer park, yet only 2 years ago 30-odd dwellings in the city had no plumbing of any description and were dependent for sewage disposal upon the well-known "outhouse".

Newton currently is zoned 96.7% for residential purposes, 1.4% for business establishments and 1.9% for manufacturing enterprises. In view of the fact that Newton has been known for many years as the "Garden City", with practically every home built on a generous-sized lot, with lawns and flower and vegetable gardens, and taking into account the preponderant percentage of our total area devoted to domestic housing, we can readily see that severe demands and extremely high peaks are experienced by the municipal water-supply system. The city's sprawling nature has added greatly to the department's distribution problems. Industrial and commercial enterprises to date have not presented problems difficult of solution as regards water supply. However, it is to be noted that installations of this kind, past and current, are located on the perimeter of the city and, subsequent to the city's final change in its mode of supply, will in all cases be comparatively well removed from the points where water is to be fed into the distribution system under pressure. Notable

industrial development has been undertaken since 1946 in the areas of Newton Highlands and Newton Upper Falls bordering Needham Street. Commercial development familiar to all traveling the Worcester Turnpike took place in the construction of the Chestnut Hill shopping center.

The largest single project ever undertaken by the city of Newton was the development of Oak Hill Park, a 412-unit housing project to provide living quarters for returning veterans. Construction of this project commenced during 1948 and was completed in 1949.

Distribution

In the year 1934, the Newton water-distribution system consisted of 211.31 miles of cast-iron water mains, varying in size from 4 to 20 in. in diameter, serving a population of approximately 70,000 people, with a per-capita daily demand of 65.83 gal or an average daily consumption by the city of 4.654 mil gal. In all, 14,886 services were in use at that time, all of which were metered and accounted for 78.3% of the water supplied to the distribution system. As a result of a trunk-main survey undertaken by the Pitometer Co. in 1933 at the direction of the city government, a comprehensive main-cleaning program was undertaken, which, when completed, restored the city's trunk-main system to a condition capable of meeting any short-term demands to be placed upon it. Again in 1934 the Pitometer Co., after a survey and studies, issued a further report with recommendations for the future to meet anticipated requirements. In accordance with certain of the recommendations of the latter report, construction was begun in the year 1935 of what is now known as the Northern Belt Loop Main. The route of this 12″ cast-iron bitumastic-lined main started in the extreme northern section of Newton proper, continuing within close range of the northern city line through sections of Newtonville, West Newton and Auburndale, its purpose being to tie in existing gridiron system with a trunk feeder capable of markedly improving the supply in that entire area for domestic, industrial and commercial use, for adequate fire protection and to provide for anticipated growth. Construction was undertaken by the Water Department's own forces and a total of 14,832.1 ft was laid during that year. In the following year of 1936, construction was again under-

taken by the department staff and 7,316 ft were laid. The project was completed in 1937 with the installation of the final 8,418.8 ft, making the complete Northern Belt Loop 30,566.8 ft. The benefits derived from this construction are apparent today, since it can be definitely stated that the sections receiving the benefit of the support thus afforded are almost completely free of distribution difficulties, problems or complaints.

It had likewise been determined, as a result of the investigation and studies of 1933 and 1934, that the Oak Hill section, located in the southern area of the city, would be in need of trunk-main reinforcement as soon as anticipated housing construction and accompanying population increase took place. Furthermore, Oak and Baldpate Hills and the area surrounding them were not alone relatively high in elevation above Boston base, but also were comparatively remote from points of pressure application. Consequently, for the same reasons which motivated construction of the Northern Belt Loop Main, the first section of 16″ cement-lined cast-iron main, to be ultimately known as the Southern Belt Loop, was laid in 1940 by department forces, from a point just outside the Needham Street Pumping Station along Christina, Wallace and Winchester Streets, a distance of 3,559.1 ft.

World War II and the scarcity of both men and materials which existed not alone during the war but for an extended period thereafter prohibited any further construction on this project until 1949. At that time completion of this main became mandatory, since the veterans' housing project known as Oak Hill Park, previously mentioned, was in the final stages of construction, with many of the homes already occupied. Water supply to the project was available from the 8″ main on Dedham St., but the support to be provided by the Southern Belt Loop was essential in the matter of adequate fire protection and domestic supply. Work would have been undertaken sooner had materials been available. A contract was drawn with the Bonded Construction Co. and there was laid by the latter along the balance of Winchester St. to its junction with Nahanton St., along Nahanton St. westerly to the Charles River and from the latter point through undeveloped land to Oak Hill Park, a total of 3,558.2 ft of 16″ cement-lined cast-iron main and 7,737.2 ft of 12″ cast-iron main,

likewise cement-lined. The Southern Belt Loop, as completed to Saw Mill Brook Parkway in Oak Hill Park, where it connects with several 8″ laterals, totals 14,854.5 ft of 16″ and 12″ pipe.

As originally planned, the Southern Belt Loop Main was to be continued along Brookline St. and Dudley Road, to connect with the 16″ bitumastic-lined cast-iron main on the Worcester Turnpike. A subsequent change in planning, which will be described later, has eliminated the need of this extension. Beneficial results already realized include adequate fire protection for the City Infirmary and the Working Boy's Home, located on Winchester St., and the meeting of greatly increased demands presented both by the development of Oak Hill Park and the construction of a very large number of dwellings by private contractors, from 1946 to the present time. It will also meet adequately the requirements of a very large area of the Oak Hill district still available for residential building. Last but not least, the city's eventual mode of supply will place this area at the southern end of the system, far removed from points of pressure application, with consequent head loss necessitating the carrying capacity of a trunk main of large cross-sectional area.

Restoration and Maintenance of Trunk Main Coefficients

Based upon the department's timely investigations previously mentioned, a program of cleaning and cement lining in place, of certain trunk mains, was undertaken commencing in 1941, to restore and maintain the carrying capacity of these important feeders. Four thousand one hundred ninety-two feet of 12″ main on Waverley Ave., Newton, connecting with the 20″ on Ward St., were processed during the first year of this program. World War II postponed further operations until 1944, when 1,000 linear feet of 6″ and 7,620 ft of 8″ were cleaned and lined on Grove St., Newton Lower Falls. The year 1945 saw similar work done on 4,800 ft of 12″ and 3,230 ft of 8″ on Washington St., running from Commonwealth Ave. to the Wellesley line, through the Auburndale and Newton Lower Falls districts. The Oak Hill section next received attention, when 8,651 ft of 8″ on Parker St., between the 16″ on the Worcester Turnpike and its junction with Dedham St., along Dedham St. to Brookline St., were cleaned and

lined in 1946. The program as originally planned was completed with operations in 1947 on 4,991 linear feet of 8″ on Dedham St., between the 20″ on Winchester and the junction with Parker Street. Linear footage of the program, as described, totalled 34,484 ft. The program was eminently successful in restoring the main coefficients, as indicated by determinations made before and after, and resulted in the elimination of low pressure and inadequate flow conditions in the several areas served. A systematic program of dead-end elimination and the replacement of 4″ and smaller mains with a minimum size of 6″ has been carried out annually, except for the period when materials were not available.

Development of the City's Well Supply

The city's existing underground water supply was fully described in Mr. Sampson's paper of 1934 and needs no further elaboration here. During the early part of 1937 it was apparent that further development of the source of supply was necessary. Accordingly, agreements were made successively with the Hughes Well Drilling Co. and the B. F. Smith Co. to make a thorough survey of potential sites by test borings, with the objective of producing an additional 2 mgd. At the same time the Layne-Bowler New England Co. conducted an independent underground investigation, in an attempt to discover a location having water-bearing gravel strata of sufficient depth to justify the construction of a comparatively deep gravel-packed well. After a period of several months' intensive underground exploration and careful study of the observed data by Water Department officials and George A. Sampson, Consultant, it was evident that the city's needs would best be served by the installation of two large dug wells, located approximately midway between existing supply wells No. 1 and 2, and approximately 500 ft from each other.

A contract was therefore drawn, after the taking of bids, with T. Stuart & Sons Co. for the construction of two concrete-walled dug wells of the conventional type which had served the city so reliably, one measuring 20 ft in diameter and 41 ft deep, to be known as Well No. 3, and one likewise 20 ft in diameter but only 33 ft in depth, to be known as Well No. 4. A contract was drawn with Fairbanks Morse & Co. for pumping equipment, which consisted of two 1-mgd turbine-

type pumping units and appurtenances for each well. Both wells were put into regular operation in December, 1937, and have continuously yielded a minimum of the desired 2 mgd ever since.

The final development worthy of mention relating to the underground supply was the construction of a 30″ bitumastic-lined cast-iron supply main, connecting an existing 24″ main in the upper water reservation to the Needham Street Pumping Station, a distance of 4,450 ft. The purpose of its installation was to by-pass the old wooden collecting gallery and transmit the yield from the four supply wells directly to the pumping-station suction well. The construction was engineered in a manner to permit the collecting gallery, by means of a low-lift pump, to supply extra gallonage over and above the yield of the supply wells, as demanded by hydraulic level in the suction well at the Needham Street station. The purpose of the project was to improve the quality of the water supplied to the distribution system. A second objective was to make available two supply lines under the Charles River, to ensure uninterrupted supply under any foreseeable conditions from the source of supply on the Needham side of the Charles.

Construction was undertaken in late 1938, subsequent to the granting of P.W.A. assistance, and the entire project completed in the late spring of 1939. A marked improvement in the character of the water yielded by the source was achieved and the results of the whole project were eminently satisfactory.

Preparation and Progress toward Taking Entire Water Supply from the Metropolitan District Commission

The city of Newton is a charter member of the Metropolitan District, but in respect to water-supply needs did not find it necessary to make a connection until the year 1921. At that time an agreement was entered into and the city constructed a booster pumping station, located off Reservoir Drive, Chestnut Hill, equipped with two motor-driven 5-mgd centrifugal pumps, taking suction through a 20″ line, connected to the Metropolitan 30″ main in Ward Street, and discharging into the city's 20″ distribution main also laid therein. This permitted the city to augment its own supply under conditions of emergency, or when periods of drought reduced the yield of the city's

source sufficiently to require support. Likewise for a period of years, after necessary pipe connections had been made, the head pressure available, by the use of the city's Waban Hill covered reservoir as a balancer, on the Metropolitan supply to Watertown, was made effective through the use of this Reservoir Drive booster station, to withdraw daily from the Metropolitan supply the equivalent of the Watertown demand.

After the development of the city's own supply, taking place in the thirties, it was found unnecessary to take additional supplies from the Metropolitan system annually in amounts of 100 mil gal or more until 1946. From that year through 1951, our demand from the Metropolitan increased rapidly, totalling approximately 833 mil gal for the latter year.

The following quotation was taken from Mayor Theodore R. Lockwood's inaugural message, read on January 1, 1948:

> "Once more the matter of whether or not the City should take its water from the Metropolitan District is a current topic of discussion. This is a matter of many years' standing, and although in the past there was unfavorable reaction to this sought-for change, now, it is my measured opinion that we should avail ourselves of the Metropolitan District facilities as soon as technically possible, as this will result in improved quality, ample quantity and lower cost, permitting existing water reservation land to be released for sale and development while the opportunity is offered."

This plan of Mayor Lockwood's was implemented by his appointment of Willard S. Pratt to the office of Director of Public Works in early 1948. The Director of Public Works proceeded to enter into preliminary discussions with Metropolitan District officials, with a view to the formulation of a final agreement between the two parties. The period during which the Metropolitan pressure tunnel and shafts were under construction, i.e. from 1946 to 1951, was necessarily a planning stage as regards the city's final connection, since completion of the tunnel construction was an essential factor. Preliminary planning was crystallized under date of August 17, 1950, when Coffin & Richardson, Consultants, entered into an agreement with the Metropolitan District Commission, whereby the former would submit a report, relative to the water-supply requirements of the city of Newton, particularly with respect to the need of additional supply mains,

to utilize most efficiently the proposed Metropolitan Pumping Station at Shaft 6 on Commonwealth Avenue. This report, when submitted in early January, 1951, was based on an investigation of the following scope:

1. A study of Newton's population and water-consumption records, together with an estimate of future population and consumption over a 30-year period.
2. Review of previous engineering reports on the Newton system.
3. A hydraulic study with recommendations based thereon for adapting the Newton system to take its entire supply from the M.D.C.
4. A study of booster pumping-station requirements in Newton, to ensure adequate flows and pressures at the higher elevations of the city.
5. An estimate of the cost of the recommended improvements.

Recommendations and final plans, adopted subsequent to the issuance of this report, include the following engineering projects, either in stages of construction or complete as regards plans:

1. Metropolitan pumping station at Shaft 6 on the City tunnel, located just off Commonwealth Ave. beyond City Hall. This station is well along in construction and equipment will include 3—16—DD—20 Warren horizontally-split centrifugal pumps, each with a capacity of 7½ mgd against a 62-foot head, operating at 880 rpm, having 18″ suction and 16″ discharge, and equipped with 16″ Chapman cone valves. Each pump will be driven by a 100-horsepower, 800-rpm, 440-volt, 60-cycle, 3-phase electric motor. In addition, the third pump, which ordinarily will be a standby unit, in case of power failure will be powered by a Buda, 6-cylinder, model DC 1879 Diesel engine, developing 170 hp at 1,000 rpm. The Diesel will be equipped with a silencer, heat exchanger and roof exhaust. The station pumping units will be controlled automatically, according to water level in the City's Waban Hill covered reservoir, and will operate without attendance, except for a daily visit for maintenance and inspection purposes.
2. Thirty-inch main to be laid in Commonwealth Ave. between Chestnut and Centre Streets. The Shaft 6 Pumping Station will be connected to this 30″ main. Plans on the main construction are in the completed stage and bids will be taken for its construction later this fall.
3. High-service, southern pressure district, elevated water-storage tank. A 400,000-gal double ellipsoidal tank is now under construction on Oak Hill by the Chicago Bridge & Iron Co. under contract with the city of Newton, with completion scheduled before November 1st.
4. Booster pumping station, to supply the high-service southern pressure district and maintain levels in the elevated storage tank on Oak Hill. Construction of this station on Dudley Rd. at the Worcester Turnpike will proceed simultaneously with that of the 30″ pipe line on Commonwealth Ave.

The basic plan for the Newton distribution system calls for its division into a northern and a southern pressure district. The dividing line is roughly from the Boston line along Washington St. to its junction with Commonwealth Ave. and along Commonwealth Ave., westerly to the Charles River. Approximately one-third of the city's water demand stems from the Northern Pressure District. This district has been supplied since June, 1950, except for an 8-month interval during the fall of 1950 and the winter of 1951, by the Metropolitan District 60″ main, laid in Washington St. Two 20″ connections, equipped with Venturi meters—one at West Newton Square and the other at Church and Washington Streets—tie in with the city's 12″ Washington St. main. After the final resumption of the previously described mode of supply in May, 1951, the entire Northern Pressure District was thoroughly flushed and this has resulted in almost complete freedom from complaints of any nature. The Metropolitan Norumbega distribution reservoir regularly supplies the Northern Pressure District, with installed connections permitting the use of the Metropolitan Weston reservoir under emergency conditions.

The Southern Pressure District, which embraces the balance of the city, will include a High-Service Southern Pressure District, located in the Oak Hill area and supplied by pumping and storage equipment previously described. Specifically, the Baldpate Hill area (elevation 308) and Oak Hill area (elevation 297) will be encompassed in this high-service southern pressure district, bounded by Dedham and Brookline Streets and Dudley Road. While Oak Hill, as just pointed out, does not have as high an elevation as Baldpate Hill, nevertheless topographical conditions justified location of the tank on the lower of the two elevations. In order to ensure a minimum head loss in the so-called force main from the 250-gpm booster station to the elevated tank, running along Dudley Rd. and Greenwood St. to Hartmann Rd., the department entered into a contract with the Centriline Corp. to clean 5,829 ft of 8″ cast-iron main and to line with cement in place 4,707 ft of 8″ cast-iron main. The balance of the force main is recently laid 8″ cement-lined pipe on Hartmann Rd. plus 1,200 ft of 12″ cement-lined cast-iron main from Hartmann Rd. to the tank site. This contract work is just now completed and the main coefficient will be determined at once.

The measures taken in this area will eliminate a most hazardous situation in respect to domestic supply and fire protection, which has existed for years. During the summers of 1950, 1951 and 1952, in an attempt to alleviate conditions there, the department gated off all mains crossing the Worcester Turnpike, with the exception of the 12″ on Chestnut St. and the 8″ on Langley Road. The largest-capacity pumping unit at the Needham Street station was operated continuously during these periods, providing a head pressure up to 140 lb per sq in. and effective in the gated-off area. This procedure did result in somewhat better conditions at the higher elevations in the Oak Hill area, but admittedly was an emergency measure, taken under conditions when economy and efficiency had to be forgotten. The New England Peabody Home for Crippled Children, located high on Oak Hill, has required individual emergency pumping arrangements nightly during the summer months. The writer believes that all water-works men will appreciate the relief to be felt by members of this department when the High-Service Southern Pressure District is in operation next year.

Since approved plans call for continued use and ownership by the city of the 10½-mil gal Waban Hill distribution reservoir, it was decided to put this structure in first-class condition. The reservoir is divided into four sections, two of which were built about the turn of the century, the two final sections being completed in 1916. Leakage of later years had been noted on Waban Hill, to such an extent that the reconstruction of streets in the area was seriously interfered with. After inspection, a contract was drawn with the Cement Gun Co. of Allentown, Pa., in July, 1951, to gunite the interior face of all exterior walls from a point inside the floor and wall joint to a point above high-water line. Careful inspection had revealed that the whole structure other than the exterior walls was in surprisingly good condition. Subsequent to the completion of the guniting work, our piping, valves and fittings in the central chamber were thoroughly chipped, steel-wire brushed and painted with corrosion-resistant coating. The effectiveness of this major repair and restoration work was apparent upon completion of the job, evidenced by the great reduction of ground leakage on Waban Hill.

Current Demand

It is basic that many problems related to supply and distribution arise from the system's comparative inability to meet demand. Newton's demand for the month of July, 1952, was over 100 mil gal higher than for any previous month in the history of the department. A total of 390.539 mil gal was supplied during the month, or a daily average of 12.598 mil gal. The peak day was Monday, July 14, when a total of 17.118 mil gal was consumed. During the period between 7 and 8 P.M. on that day, the peak hour, there was a demand on the system of 1.379 mil gal—a rate of 33.096 mgd, or 453.74% of the 1951 daily average.

Conclusion

After final connections are made to the Metropolitan supply system in 1953, plans call for a survey under the new flow conditions in the trunk-main system and gridiron, to determine the remaining areas requiring reinforcement. The carrying-out of the recommendations of this planned survey should complete this period of system revision and, we are confident, will put the Newton Water System in a condition capable of adequately meeting foreseeable demands of the future.

PROCEEDINGS

Seventy-First Annual Convention
Groton, Conn.
September 8-10, 1952

The Seventy-First Annual Convention of the New England Water Works Association was held at the Hotel Griswold, Groton, Conn., on September 8, 9 and 10, 1952.

Monday, September 8

Morning Session

President Frederick O. A. Almquist in the Chair.

The Annual Reports of the Secretary, Treasurer, Editor, Finance Committee, Committee on Legislation, Committee on Technical Program, Committee on Committees and Committee on Reciprocal Relations with the Institution of Water Engineers were presented and accepted.

The President declared the polls closed and appointed as tellers George N. Watson, James L. Dallas and Marshall S. Wellington.

The following reports of technical committees were presented and accepted: Committee on Survey of Ground-Water Supplies in New England, Committee on Water Quality and Treatment, Committee on Specifications for Cast-Iron Pipe and Fittings, Committee on Reinforced-Concrete Pressure Pipe, Committee on Laying Cast-Iron Water Mains, Committee on Specifications for Steel Pipe, Committee on Standardization of Pipe Flanges and Fittings, Committee on Hydrant Specifications, Committee on Gate-Valve Specifications, Committee on Federal Activities, Committee on Fluid Permeability, Committee on Water Rate Schedules, Committee on Conservation, Development and Utilization of Water Resources, and Committee on Costs and Charges for Installing Mains and Services. In the case of the Committee on Gate-Valve Specifications, it was Voted that the report of the committee be accepted without the provision for its

discharge. All the reports mentioned above are printed in this issue of the JOURNAL.

Secretary Knox announced the election of the following to membership in the Association: *Members:* David C. Buckley, Civil Engineer, R. H. White Construction Co., Oxford, Mass.; John B. Casazza, Sanitary Engineer, Commonwealth of Massachusetts, Merrimac, Mass.; Charles H. Darling, Superintendent, Water Department, Sterling, Mass.; William Henry Green, Jr., Bacteriologist, Water Division, Metropolitan District Commission, Boston, Mass.; Claude F. Halsey, Superintendent, Water Department, Lanesborough, Mass.; Peter E. Pallo, Sanitary Engineer, Hackensack Water Co., Oradell, N. J.; Carey A. Walbridge, Chairman, Water Commissioners, Peterborough, N. H. *Associate:* Alabama Pipe Co., New York, N. Y.

Afternoon Session

A paper on "Progress in Solving Supply and Distribution Problems at Newton, Massachusetts," was read by Mark F. Croker, Commissioner, Water Department, Newton, Mass.

A paper on "The North Fork Dam of the Asheville, North Carolina, Water Supply" was read by Truman H. Safford, of Charles T. Main, Inc., Charlotte, N. C.

A paper on "Guides for the Selection of Chemical Feeders" was read by P. A. Coffman, Jr., Chief Engineer, Omega Machine Co., Providence, R. I.

TUESDAY, SEPTEMBER 9

Morning Session

This session was devoted to a Superintendents' Round Table, consisting of a panel discussion of Fluoridation of Public Water Supplies.

A paper, "The Optimum Vehicle for Fluoridation—Water or Milk," prepared by J. E. McKee, Associate Professor of Sanitary Engineering, California Institute of Technology, and affiliate of Camp, Dresser & McKee, consulting engineers, Boston, was read by Fred E. Smith.

This was followed by a general discussion by Dr. F. E. Law, Regional Dental Consultant, U. S. Public Health Service, Boston,

Mass., George W. Wood, Chief Engineer, Board of Water Commissioners, New Britain, Conn., and others.

A moving picture film, "Made to Measure", was shown by the Rockwell Manufacturing Co., Pittsburgh, Pa.

WEDNESDAY, SEPTEMBER 10

Morning Session

A paper, "Water Magic," was read by Fred S. Gibbs, of F. S. Gibbs, Inc., Boston, Mass.

A paper, "Studies on the Corrosion of Cast-Iron Water Pipe," was read by John R. Baylis, Engineer, Water Purification, Chicago, Ill.

A paper on "Pumps and Pumping Stations" was read by Richard Hazen, Consulting Engineer, New York, N. Y.

Afternoon Session

A paper on "London, England, Water Supply" was read by Henry F. Cronin, Chief Engineer, Metropolitan Water Board, London, England.

A paper on "Application of Ultra-violet-ray Sterilization to Water Treatment" was read by F. Wellington Gilcreas, Assistant Director, Chemical Laboratories, State Department of Health, Albany, N. Y.

Evening

Through the courtesy of Morton A. Mencher, President, Hotel Griswold, and the Water and Sewage Works Manufacturers Association, Inc., a social hour was held on the lawn patio. This was followed by a banquet, served in the main dining-room of the hotel, through the courtesy of the Water and Sewage Works Manufacturers Association, Inc.

A certicate of Honorary Membership was presented by President Almquist to Henry F. Cronin, of London, England.

AWARD OF THE DEXTER BRACKETT MEMORIAL MEDAL

PRESIDENT ALMQUIST. At this time I shall ask Mr. Ellis Tarlton if he will report for the Committee on the Award of the Dexter Brackett Memorial Medal.

ELLIS A. TARLTON. Thank you, Mr. President.

Members of the New England Water Works Association and guests: The Dexter Brackett Memorial Medal was established by this Association in 1916, to perpetuate the memory of the man who so outstandingly and ably represented the water-works profession for many years with the Boston Water Department and later with the Metropolitan Water System, as Chief of the Distribution System and later as Chief Engineer. He was President of our Association in the years 1889 and 1890. For several years he was editor of our JOURNAL. This is the 36th annual presentation of this award, during which time 32 of our members have received it.

This year your committee, consisting of Clarence L. Ahlgren, of Manchester, N. H., as Chairman, F. M. Hennessy of Northampton, Mass., and Ellis A. Tarlton, of Danbury, Conn., were of the opinion that the most meritorious paper published in the JOURNAL in 1951 was "Sanitary Protection of Watersheds—Are We Overdoing or Underdoing It?", by Arthur D. Weston, retired Sanitary Engineer for the Massachusetts Department of Public Health.

Under Mr. Weston's leadership sanitary control of watersheds and water-supply lakes and ponds was developed to the ultimate, received its greatest impetus. Recently some people outside of the water-works profession have been attempting to nullify some of these important achievements. Mr. Weston's paper alerted us all to an important problem in the future.

Mr. Weston, our recipient, is a Dartmouth man, Class of 1908. For 40 years he was a member of the Massachusetts Department of Public Health, and 20 of those years he was Chief Engineer. During those 20 years he saw us through the second World War, many of our greatest construction projects in the state, and some of our greatest disasters.

I might even add that he was my boss for a few years. He is a Past-President of this Association.

Mr. Weston, will you rise, please?

[*Mr. Weston stands.*] It is a great pleasure for me, on behalf of the New England Water Works Association, to present to you the Dexter Brackett Memorial Medal for 1951.

ARTHUR D. WESTON. Members of my very fondest association, the New England Water Works Association, members of the Manufacturers Association, Mr. President: I have had a number of surprises in my life. Some of them were very happy surprises and some not so happy. But the greatest surprise of all was the announcement which I received from your Secretary, Joseph Knox, about ten days to two weeks ago, informing me that I had been voted this award. That was a tremendous surprise. Of course it was a tremendous honor. I thought that you had honored me about as greatly as any man could be honored when you made me an Honorary Member of the Association a few years ago. But now I have to confess that I consider the Dexter Brackett award the greatest award that any engineer in this country can receive. I thank you very much.

COMMEMORATIVE AWARD

PRESIDENT ALMQUIST. In 1949 a second award was established, for the member whose paper was given and published in the JOURNAL of the New England Water Works Association and selected by the committee as being of considerable value to the water-works profession, next in merit to the Dexter Brackett award. It was established as a Commemorative Award in memory of a deceased member of our Association who has distinguished himself in the several fields of the water-works profession.

This year the award is made in memory of Robert Spurr Weston. During his membership in this Association he wrote and delivered 18 papers before the Association. His paper on "Lead Poisoning and Its Prevention" won for him the Dexter Brackett Memorial Award in 1920. He also received the Desmond Fitzgerald Medal of the Boston Society of Civil Engineers. He wrote many other papers and served on numerous committees. He was a distinguished sanitary chemist, and it is fitting that this year's award should go to another well-known sanitary chemist, Mr. I. Laird Newell, of Hartford, Conn. Will Mr. I. Laird Newell come forward, please?

[*Mr. Newell comes forward.*]

Mr. Newell is associated with the Henry Souther Engineering Co. of Hartford, and his paper was entitled "The Corrosion of Domestic Galvanized Hot-Water Storage Tanks."

It is a pleasure for me to present this award to you, Mr. Newell.

I. LAIRD NEWELL. Thank you very much. I am very pleased and honored to receive this award. I hope my paper will be of some practical value to the members.

* * * *

PRESIDENT ALMQUIST. It has been the custom of this Association to award certificates to those members who have a record of 25 years of service in their work. Mr. Sidney S. Anthony has completed 25 years of service for the Augusta, Maine, Water District. Unfortunately Mr. Anthony is not here tonight, but his certificate will be sent to him.

I should like now to call on Mr. George Watson, chairman of our tellers, and ask him to give us a report on the election.

REPORT OF THE TELLERS OF ELECTION

Mr. President and members of the New England Water Works Association: This is a report of the tellers of the election. A total of 344 votes was cast.

For PRESIDENT: Stanley M. Dore, 336; blanks, 8.

For VICE-PRESIDENT: Roger G. Oakman, 337; blanks, 7.

For DIRECTOR: Edward L. Tracy, 336 votes.

For TREASURER: William P. Melley, 339 votes.

Respectfully submitted,

(*Signed*) GEORGE N. WATSON
JAMES L. DALLAS
MARSHALL S. WELLINGTON

PRESIDENT ALMQUIST. By your action you have elected for President Mr. Stanley M. Dore, and I shall ask Mr. Dore to stand.

For Vice-President, Mr. Roger G. Oakman.

For Treasurer, Mr. William P. Melley.

As your new Director, Mr. Edward L. Tracy of Vermont.

PRESIDENTIAL ADDRESS

By

Frederick O. A. Almquist

There are three times in a man's life when his mind is a blank—the first when he is born, the second when he is married, and the third when he stands up to give a speech.

September 1 marks the beginning of the fiscal year of the New England Water Works Association, and so one year ends and a new one begins. It is proper at the end of the year to pause a moment in retrospect at this, our 71st annual convention, and perhaps summarize briefly the happenings of the past year. Article 6, Section 1, of the Constitution places this responsibility on the president.

A year ago at our 70th annual convention, your attention was called to the fact that the membership had passed the 1,000 mark and that the greatest membership the Association had ever experienced was 1,042. In taking over the office of president at that time, it was suggested that our slogan for this past year might be "One Thousand and Fifty-two in '52." I was very happy during the last month to see the membership pass the previous high and it is my understanding that, as of today, the membership is 1,050. We did not quite reach our goal of 1,052, but it is within two of what we had hoped for. It is somewhat difficult to account entirely for the increased interest, but I think that some of the credit may be due to a slight change in the type of program and some credit to the carry-over of the splendid work the membership committee started a year ago.

The slight change in the type of program included at least two speakers on subjects other than true water-works subjects, one of these talks in December being given by Senator Leverett Saltonstall of Massachusetts and the other by Ralph M. Binney, Vice-President, First National Bank of Boston. The December meeting was the largest for that month in several years. Several of our Boston meetings have been nearly the largest for several years and the average

has been the highest by quite a number of members during the past few years. The chairman of the program committee was ably assisted by two sub-chairmen, one in charge of the chemists' session and the other in charge of the superintendents' session. An effort was also made to have more of the smaller water-works superintendents give papers and this year we were successful in having at least three superintendents of relatively small water works give papers at the main afternoon session. In one or two cases, the superintendents commented that, in spite of the problems and difficulties encountered by the water-works superintendents, the townspeople were very much unaware of the general problems. This leads me to remark on one of the features your president has tried to emphasize during the past year.

In scanning magazines and newspapers, your president finds that nearly every celebrity, especially of the Hollywood set, chooses a certain type of liquid refreshment over any other, that only men of distinction prefer another type of liquid refreshment, that certain types of cigarettes are used to the exclusion of all others, etc. I find in none of the advertisements that water is preferred, used, or even available in the event the public had not noticed. You may say that these are individual corporations which thus advertise. I turn the pages a little farther and find the Portland Cement Association advertising for all of the Portland cement companies; I find Chambers of Commerce pointing to the advantages of particular areas; I find manufacturing associations advertising for a group of member companies, the meat industry and many others, and I find all sorts of advertisements made on a group basis and paid for by a representing agency, some highly competitive, others not. You ask who might pay for general advertising beyond the limited, if not entirely extinct, local advertising. Associations such as ours might take on such a responsibility and I submit to you that money so spent could be spent in many other ways which would be less beneficial to the water-works profession.

The water-works profession is an old and honorable profession. It is as old as man himself and, at the present time, water is probably the most precious commodity we have, next to the air we breathe. In the early days, the need of water was not great and it

was found generally in abundance. Now we find that, with increasing world population and the increased use of water in its many forms, the abundance of water is being questioned. It is probably safe to say that paralleling the increasing need of water is the ingenuity and ability of man to obtain it. The problem, therefore, does not seem to be the lack of engineering ability, but perhaps the lack of knowledge by Mr. Average Citizen today of true facts in the problem of obtaining and distributing water. As the costs to obtain water become greater, the time from the first planning to the completion of a project appears to become longer.

There is probably no greater trust of an engineering profession or a water-works industry than is evidenced by the fact that almost universally a traveler drinks water from the faucets supplied from a public water supply without question as to its safety. As one journeys from city to city, the question of safety never enters a person's mind and only does the question of water supply at all enter his mind when he turns the faucet and finds no water.

As you well know, depletion of a water supply can happen, not only in small communities but in large communities. The engineering and water-works profession has progressed in skill and can solve almost all the problems. The profession has come a long way when man is capable of coaxing precipitation from the clouds and placing it almost where desired, when naturally it might have fallen hundreds of miles away.

It would seem that, with such an important and honorable profession, it would be the duty of the water-works profession to provide means for combating the apathy of our citizens in the question of water supply and informing them of the intricacies of the problems of providing an adequate and safe supply at all times. Adversities are sometimes blessings, and adversities through depletion of water for some of our cities have awakened them to the fact that water is of great importance. It is unfortunate when adversity is necessary to arouse our citizens to a problem of which they should be aware long before adversity is experienced.

The arousing of our citizens to the importance of water works can be done only through stepping up our tempo of publicity and public relations. During the past year a committee was appointed to

look into this problem and this committee will now be one of our regular standing committees. The executive committee has voted to allot a sum of money during the next year, if desirable, for publicity purposes. It is your president's hope that this will be the beginning of a better understanding between the general public and the water-works profession.

It would not be worth while, however, if we did not obtain some results. And what are some of the results for which we should strive? We should hope to raise the standard of the water-works man in his community to the level where it belongs; we should hope to have the public realize the preciousness of water, and that it costs money to produce it; we should hope to have the backing of the community on improvements or additions to our water supplies, and we should hope to have continuity of service for experienced and qualified men, to the exclusion of political appointments. These are but a few of the many benefits we should hope to obtain through better publicity and better public relations.

And now to review briefly the condition of the Association. The individual reports of the Secretary, the Treasurer and the Editor furnish you with details as to membership, finances and publication. In spite of a deficit budget we finish this year in the black. The Association is in excellent condition in all respects. I wish to commend and thank the various committee members who have served during the past year, and particularly the program committee, whose chairman was Fred Smith and whose able lieutenants were Kenneth Knowlton and Sherman Rogers.

One could not close without saying a word about the efficiency of our Secretary, Joseph C. Knox, and his able assistant, Mrs. Alice R. Melrose. It is the result of their work which causes the Association to run on an even keel and without them your president would be handicapped to a point of frustration.

We are also greatly indebted to the officers and members of the Water and Sewage Works Manufacturers Association for their continued help, to Mr. Everett M. Jones, president of the Water and Sewage Works Manufacturers Association, to Mr. John G. Stewart, Manager, Mr. Reginald Hayes and Mr. John S. O'Reilly, Chairman of the Entertainment Committee, and last but not least, Mrs. Thomas

S. Lawrence, Chairman of the Ladies' Entertainment Committee. Their efforts comprise a considerable factor in the operation of this Association and we appreciate their close coöperation.

In conclusion, I wish to say that this past year has been a memorable one for me, and it has been a distinct pleasure and honor for me to serve as your president.

As the new year begins, you will be served by your new president, and it is my pleasure and my duty to present to you the president for the next year, Mr. Stanley M. Dore.

STANLEY M. DORE. Members of the Association, I wish to thank each and every one of you for the confidence you have shown in me in electing me to this office, and I assure you that I shall do my best not to betray the confidence you have had in me. When I look over the list of illustrious predecessors and their records, I enter this office with deep humility and with an awareness of the responsibilities in the coming year.

That concludes the formalities of the business meeting and I wish to declare this meeting adjourned. I shall turn the rest of this program over to Mr. O'Reilly, of the Entertainment Committee.

[*Adjourned.*]

ANNUAL REPORT OF THE SECRETARY

Mr. President and Members of the New England Water Works Association:

The Secretary herewith submits the following report of the changes in the membership during the past fiscal year and the general condition of the Association.

The present membership is 1,042, constituted as follows: 14 Honorary Members, 862 Members, 2 Junior Members, 129 Associate Members and 35 Corporate Members.

MEMBERSHIP

				Total
September 1, 1951—Honorary Members, Total		13		
Elected:				
February 14, 1952	1	1		14
September 1, 1951—Members, Total		819		
Withdrawals:				
Died	13			
Dropped	13			
Resigned	6	32	787	
Elected:				
September 13, 1951	16			
October 26, 1951	15			
November 15, 1951	2			
December 20, 1951	5			
January 17, 1952	4			
February 14, 1952	9			
March 20, 1952	6			
April 17, 1952	5			
May 15, 1952	3			
June 12, 1952	2			
August 8, 1952	7	74		
Reinstated:				
December 20, 1951	2			
January 17, 1952	1	3	77	864

September 1, 1951—Associates, Total		126		
Withdrawals:				
Dropped	2			
Resigned	2	4	122	
Elected:				
October 26, 1951	2			
February 14, 1952	1			
March 20, 1952	1			
May 15, 1952	1			
August 8, 1952	1	5		
Reinstated:				
January 17, 1952	1			
August 8, 1952	1	2	7	129
September 1, 1951—Corporates, Total		34		
Withdrawals:				
Dropped	1	1	33	
Elected:				
October 26, 1951	2		2	35
September 1, 1952—Total Membership				1,042
September 1, 1951—Total Membership				992
			Gain of	50
Total membership Sept. 8, 1952, including members elected since Sept. 1				1,050

Elections

Members

September 13, 1951—Thomas F. Coughlin, Stephen E. Dore, Jr., William A. Fisher, Alexander Good, Francis L. Hamill, John J. Hoban, Merton R. Hodge, Jose H. LaRiva, Rev. Daniel Linehan, John R. Madden, Rudolph E. Martin, Grant H. Potter, J. Edgar Revelle, George E. Symons, Stayley H. Trask and Albert J. Wall. (16)

October 26, 1951—Chester E. Bradley, John J. Cotter, Thomas F. Culliney, Fred S. Daniels, James P. Donovan, W. Elwin Dunn, Alfred F. Ferullo, Carl M. Jacobson, Carl B. Johanson, Harold D. Kilgore, Jr., Lester H. Longton, Jr., Francis J. McLaughlin, Francis J. Murphy, Norman M. Winch and John P. Wold. (15)

November 15, 1951—Joseph A. Sherman and Russell F. Tennant. (2)

December 20, 1951—Alfred A. Abare, August Ammann, Kenneth J. Carl, William R. Colton and John J. Donahue. (5)
Reinstated: Irving B. Crosby and Edward M. Cahalan. (2)
January 17, 1952—George K. Allen, Oscar Cianca, Mrs. Lucille W. Hitchcock and Ezra S. Johnson. (4)
Reinstated: Robert A. Harrington. (1)
February 14, 1952—Edwin C. Bradley, Jr., Harold E. Cady, Charles O. Clark, E. Edward Faenza, Patrick J. Flynn, William J. Hynes, Darrell A. Root, Leslie M. Willard and Robert F. Woodbury. (9)
Honorary Membership: Henry Francis Cronin. (1)
March 20, 1952—John K. Donnelly, Richard F. Dutting, Charles F. Kennedy, Charles F. Kent, Wm. Neal MacKenzie and Vincent J. Petroccia. (6)
April 17, 1952—John Gadd, Philip D. Granger, Philip A. Hammond, William A. Lamont and Joseph J. Shepherd. (5)
May 15, 1952—Paul T. Anderson, Norman Bampton and Howard V. Kitchen. (3)
June 12, 1952—Raymond F. Bahr and J. Wallace Grant. (2)
August 8, 1952—John D. Buckley, Valentine O. Ketcham, Irving N. MacKenzie, Edward Martinsen, Edmund T. Roach, Vernon C. Russell and John B. VanWhy. (7)
Reinstated: Robert A. Glines. (1)

Associate Members

October 26, 1951—The Stephen B. Church Company and General Electric Company. (2)
January 17, 1952—Reinstated: Perrin, Seamans Company, Inc. (1)
February 14, 1952—Lovell Chemical Company. (1)
March 20, 1952—Donnelly Products Company. (1)
May 15, 1952—Cummins Diesel of New England. (1)
August 8, 1952—Reinstated: The Foxboro Company. (1)
The Pease Company. (1)

Corporate Members

October 26, 1951—Board of Water Commissioners, Swampscott, and the Board of Public Works, Reading, Mass. (2)

WITHDRAWALS

Members

Resigned—Walter B. Bushway, Louis R. Cobb, Fortis E. Hart, Hervey J. Skinner, John R. Snell and Roscoe H. Suttie. (6)
Died—Howard E. Bailey, Carroll P. Bassett, George W. Booth, Charles J. Crump, Charles Haydock, Ernest E. Lothrop, Joseph G. Lufkin, Julian L. McKenzie, William T. Morrissey, Frank L. Northrop, Eugene J. O'Neil, Jr., Lazarus Rubin and George A. Taber. (13)

Dropped—Alfred A. Abare, August Ammann, John E. Anderson, Silas L. Briggs, Francis E. Butland, John J. Campobasso, John J. Donahue, Gerard J. Gaynor, Lester H. Longton, Jr., Albert P. McCann, Frank Neiduski, Peter F. Riopelle and Stanley W. Turner. (13)

Associate Members

Resigned—Mathieson Chemical Corporation and Charles L. Shea Co. (2)
Dropped—The Edson Corporation and The Chemical Fire & Rust-Proofing Corporation. (2)

Corporate Members

Dropped—The Norwood Board of Selectmen. (1)

RECEIPTS FOR THE FISCAL YEAR SEPTEMBER 1, 1951, TO SEPTEMBER 1, 1952

Entrance Fees	$ 258.00
Dues of Members of all grades	7,956.29
Dividends	602.00
Advertisements	5,663.00
Subscriptions	622.13
Journals	179.61
Membership Certificates	55.50
Membership Lists	6.25
Total Receipts	$15,342.78

There is due the Association:

Dues	$ 87.50
Advertising	89.25
	$176.75

Respectfully submitted,

(*Signed*) JOSEPH C. KNOX, *Secretary*

ANNUAL REPORT OF THE TREASURER

Boston, September 5, 1952

To William P. Melley, Treasurer,
New England Water Works Association,
Boston, Massachusetts.

We have examined the statement of assets and funds and the statement of cash receipts and disbursements of the general fund of the New England Water Works Association for the year ended August 31, 1952. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

We traced all recorded receipts into the depositary bank, verified the general fund bank account and petty cash fund as at August 31, 1952, and examined properly approved vouchers for all disbursements. We also verified by direct communication the investment funds on deposit in the Milton Co-operative Bank, and on September 3, 1952, we examined the United States Treasury savings bonds and the paid-up coöperative bank shares at the First National Bank of Boston.

In our opinion, the accompanying statement of assets and funds and the note thereon and the related statement of cash receipts and disbursements of the general fund present fairly the financial position of the New England Water Works Association at August 31, 1952, and the recorded cash receipts and disbursements for the year then ended, on a cash basis consistent with that of the preceding year.

(*Signed*) SCOVELL, WELLINGTON & COMPANY

STATEMENT OF ASSETS AND FUNDS (Exhibit A)

As at August 31, 1952

Assets

Securities, invested funds		
U. S. Treasury savings bonds G 2½s, 1954	$10,000.00	
Braintree Co-operative Bank, 10 paid-up shares	2,000.0	
Milton Co-operative Bank, 25 shares series of June, 1940	4,524.50	
Sandwich Co-operative Bank, 10 paid-up shares	2,000.00	
Stoneham Co-operative Bank, 10 paid-up shares	2,000.00	$20,524.50
General fund		
Cash, First National Bank of Boston	$ 5,662.81	
In office	50.00	
	$ 5,712.81	
Furniture and fixtures	1,180.00	6,892.81
		$27,417.31

Funds

Invested funds		$20,524.50
General fund		
Balance, August 31, 1951	$ 7,045.84	
Less Purchase of Milton Co-operative Bank shares	300.00	
	$6,745.84	
Excess of receipts over disbursements, Exhibit B	146.97	
Balance, August 31, 1952		6,892.81
		$27,417.31

Note: The statement above, prepared on a cash basis, includes dues received in advance, $4,726, and employees' withholding tax, $139.12. It does not reflect the following:

Accounts receivable, dues	$ 87.50
Due on account of advertising	89.25
	$176.75

No depreciation has been taken on furniture and fixtures.

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS (Exhibit B)

General Fund

For the Year Ended August 31, 1952

Receipts (exclusive of dues received in advance and employees' withholding tax)			
Initiation fees		$ 258.00	
Dues, 1951-1952 and prior years		3,230.29	
Interest		602.00	
From publication of Journal			
Advertisements	$5,663.00		
Subscriptions	622.13		
Sale of Journal	179.61	6,464.74	
Miscellaneous			
Membership certificates	$ 55.50		
Membership lists	6.25	61.75	
Total receipts			$10,616.78
Disbursements			
Publication of Journal			
Printing	$4,020.15		
Plates	170.40		
Reprints	70.28		
Reporting	188.32		
Stationery and postage	170.15		
Editor's salary	750.00		
Sundry	54.68	$5,423.98	
General and administrative			
Certificates of membership	$ 120.10		
Secretary's salary	750.00		
Assistant to secretary—salary	3,035.00		
Treasurer's salary	200.00		
Printing, postage and stationery	152.50		
Office supplies and expense	131.71		
Office rent	1,140.00		
Electricity	88.95		
Telephone and telegraph	305.55		
Auditing	85.00		
Social security taxes	196.88		
Sundry	85.61	6,291.30	

Meetings and committees			
Water works school	$ 125.00		
Printing, postage and stationery	1,418.91		
Convention expense	617.02		
Dinners	706.73		
Contribution to June conference	142.88		
Contribution to American Water Works Association	125.00		
Sundry expense	235.72	3,371.26	
Interest added to co-operative bank shares		127.00	
Total disbursements			15,213.54
Excess of disbursements over receipts (exclusive of dues received in advance and employees' withholding tax for current year)			($4,596.76)
Dues received in advance		$4,726.00	
Employees' withholding tax			
Receipts for current year	$ 139.12		
Less Payment for prior year	121.39	17.73	4,743.73
Excess of receipts over disbursements, Exhibit A			$ 146.97
Balance, general cash, August 31, 1951		$5,865.84	
Less Purchase of Milton Co-operative Bank shares		300.00	5,565.84
Balance, general cash, August 31, 1952			
Represented by			
Cash in First National Bank of Boston		$5,662.81	
Cash in office		50.00	
			$ 5,712.81

ANNUAL REPORT OF THE EDITOR

To the New England Water Works Association:

The Editor submits herewith his report for the year ending August 31, 1952. The tables of financial figures, accompanying the report, are derived from the report of the Treasurer, which contains a detailed statement of the receipts and disbursements on account of the September and December, 1951, and March and June, 1952, issues of the JOURNAL.

In Table 1 is presented a statement of the material contained in the four issues of the JOURNAL for the past year, while in Table 2 is given a comparison of the JOURNAL for the past year with those for preceding years.

TABLE 1.—STATEMENT OF MATERIAL IN SEPTEMBER AND DECEMBER, 1951, AND MARCH AND JUNE, 1952, ISSUES OF THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION

	Papers	Pro-ceedings*	Total text	Index	Adver-tise-ments	Cover and contents	Insert plates	Total pages	Total cuts
Sept., 1951	94	2	96	0	45	4	0	145	18
Dec., 1951	39	69	108	8	43	4	0	163	8
Mar., 1952	118	25	143	0	47	4	1	195	18
June, 1952	114	2	116	0	45	4	3	168	20
Total	365	98	463	8	180	16	4	671	64

*Including standard specifications.

Size. The four issues contained 671 pages, of which 463 were text.

Cost. The gross cost of the JOURNAL was $5,423.98, equivalent to $5.34 per member; the surplus was $1,040.76, equivalent to $1.02 per member.

Reprints. Reprints of papers have been furnished to authors at cost.

TABLE 2.—COMPARISON OF JOURNALS OF THE NEW ENGLAND WATER WORKS ASSOCIATION
Four Issues for Fiscal Year Ending August 31

	1943***	1944	1945	1946	1947	1948‡	1949‡‡	1950‡‡‡	1951*	1952**
Average edition (copies printed)	1,175	1,200	1,200	1,200	1,275	1,350	1,325	1,250	1,300	1,390
Average membership	798	799	806	820	846	876	905	921	957	1,017
Circulation at end of year	969	1,015	1,032	1,042	1,083	1,129	1,164	1,172	1,240	1,283
Pages of text	442	442	438	391	426	411	452	440	423	463
Pages of text per 1,000 members	554	553	543	477	516	469	500	477	442	456
Total pages, all kinds	616	621	630	586	632	615	661	666	703	671
Total pages per 1,000 members	772	777	782	715	747	702	731	723	734	660
GROSS COST:										
Total	$4,234.68	$3,406.48	$3,734.19	$4,053.08	$4,193.60	$4,239.64	$5,016.44	$5,240.51	$6,069.62	$5,423.98
Per copy	0.90	0.71	0.78	0.84	0.82	0.78	0.95	1.05	1.17	0.98
Per page	6.87	5.49	5.83	6.91	6.63	6.90	7.60	7.86	8.64	8.08
Per member	5.31	4.26	4.63	4.94	4.96	4.84	5.55	5.69	6.34	5.34
Per member per 1,000 pages	8.61	6.87	7.35	8.43	7.85	7.87	8.40	8.55	9.02	7.96
Per member per 1,000 pages of text	12.01	9.66	10.57	12.62	11.58	11.78	12.28	12.92	14.99	11.52
SURPLUS:										
Total	$609.81†	$407.21	$455.57	$162.33	$913.91	$1,990.81	$1,058.96	$1,294.73	$351.34	$1,040.76
Per copy	0.13†	0.08	0.09	0.03	0.18	0.37	0.20	0.26	0.07	0.19
Per page	0.99†	0.66	0.72	0.28	1.44	3.32	1.60	1.94	0.50	1.55
Per member	0.76†	0.51	0.57	0.20	1.08	2.28	1.17	1.41	0.37	1.02
Per member per 1,000 pages	1.24†	0.82	0.90	0.34	1.71	3.71	1.77	2.12	0.53	1.52
Per member per 1,000 pages of text	1.73†	0.92	1.29	0.51	2.52	5.55	2.59	3.20	0.88	2.20

*Including comprehensive index, 1882 to 1950.
**Including 16 pages of standard specifications.
***Including 28 pages of standard specifications.
†Net cost.
‡Including 54 pages of standard specifications.
‡‡Including 107 pages of standard specifications and recommended practice.
‡‡‡Including 25 pages of standard specifications.

Circulation. The present circulation of the JOURNAL is:

Members, all grades	1,042
Subscribers	152
Exchanges	24
Advertisers	65
Total	1,283

JOURNALS have been sent to all subscribers and to advertisers.

Respectfully submitted,

(*Signed*) GEORGE C. HOUSER,
Editor

ANNUAL REPORT OF THE FINANCE COMMITTEE

August 31, 1952

To the Executive Committee of the New England Water Works Association:

The Finance Committee herewith submits its report on the budget for the year 1951-1952, and its recommended budget for the year 1952-1953.

The Committee has examined the figures obtained from the records of the Association during the past year and has consulted with the Treasurer with reference to probable revenue and disbursements during the coming year.

The following changes have taken place in the membership list:

	Resigned	Died	Dropped	Elected	Gains
Members	6	13	13	77	45
Corporates			1	2	1
Associates	2		2	7	3
	8	13	16	86	49

The following tabulation is the estimated and actual budget for the past year:

REVENUE FOR 1951-1952

	Budget	Actual	Difference
Initiation Fees	$ 150.00	$ 258.00	$ 108.00 +
Dues	7,500.00	7,956.29	456.29 +
Interest and Dividends	550.00	475.00	75.00 —
Journal	5,850.00	6,464.74	614.74 +
Miscellaneous	50.00	61.75	11.75 +
	$14,100.00	$15,215.78	$1,115.78 +

EXPENDITURES FOR 1951-1952

	Budget	Actual	Difference
General and Administrative	$ 6,700.00	$ 6,291.30	$ 408.70 —
Journal	5,300.00	5,423.98	123.98 +
Meetings and Committees	3,000.00	3,371.26	371.26 +
Contingencies	500.00		500.00 —
	$15,500.00	$15,086.54	$ 413.46 —

The estimated deficit was $1,400, but actually the year closed with a surplus of $129.24. This surplus was due, in great measure, to the promptness with which the members paid their dues.

In looking over the revenue items for the past year, again there was a goodly increase in initiation fees, due to the number of new members acquired by the Association. As stated previously, the promptness with which the members paid dues accounts for the increase in the amount of dues paid. The increase in the JOURNAL is due to the fact that we have been able to furnish quite a few colleges and libraries with complete sets of back-number JOURNALS.

The disbursements were kept within the confines of the budget, with the exception of the JOURNAL and Meetings and Committees. The cost of the JOURNAL was exceeded inasmuch as authorization was given for an increase in the cost of the JOURNAL and the number of pages added to bring the JOURNAL technical papers up-to-date. The Meetings and Committees budget was exceeded due to the increased attendance at the monthly meetings, which entailed considerably more expense than was anticipated.

The Finance Committee has given a great deal of thought to the possibility of increasing the revenue of the Association and has arrived at the conclusion that the only source available would be to increase the dues of members of all grades. However, the Committee does not advocate this action at this time, but wishes the members to be aware of the situation that such action may be necessary.

The Finance Committee has again set up a deficit budget, keeping in mind the unstable financial condition which exists throughout business in general.

The Committee recommends the 1952-1953 unbalanced budget as follows:

BUDGET FOR 1952-1953

Revenue

Initiation Fees	$ 200.00
Dues	7,200.00
Interest and Dividends	500.00
Journal	6,300.00
Miscellaneous	100.00
	$14,300.00

Disbursements

General and Administrative	$ 7,000.00
Journal	6,100.00
Meetings and Committees	2,800.00
Contingencies	500.00
Publicity	800.00
Contribution to Monthly Meetings	800.00
	$18,000.00

The Executive Committee voted to establish a Committee on Publicity and authorized funds not to exceed $800.00 for use in the work of this committee.

We refer you to the Treasurer's report for further financial details and to the Secretary's report for changes in the membership listing.

Respectfully submitted,

(*Signed*) HENRY F. HUGHES, *Chairman*
THOMAS S. LAWRENCE
HAROLD J. TOOLE

ANNUAL REPORT OF THE COMMITTEE ON LEGISLATION

September 8, 1952

To the New England Water Works Association:

Your Legislative Committee submits herewith its report on activities in the legislatures of the New England states during the year 1952.

Regular sessions were held in only two of the six states—i.e., Massachusetts and Rhode Island. In contrast to the year 1951, when law-making bodies convened in all six states and a large number of bills having some relation to the water-works field was presented to the several legislatures for consideration, resulting in a 5½-page report in the JOURNAL, as submitted by this committee, 1952 activities were somewhat meager.

The Massachusetts General Court session produced the following, either as of interest or of importance to the water-works fraternity of the state:

Chapter 123—AN ACT AUTHORIZING CITIES AND TOWNS TO BORROW MONEY FOR THE PURPOSE OF LINING WATER MAINS.

Section 1. Clause (5) of section 8 of chapter 44 of the General Laws, as amended by chapter 83 of the acts of 1941, is hereby further amended by inserting after the word "diameter", in line 2, the words: ———, and for lining such mains with linings of not less than one sixteenth of an inch, ——— so as to read as follows: ———

(5) For laying and relaying water mains of not less than six inches but less than sixteen inches in diameter, and for lining such mains with linings of not less than one sixteenth of an inch, and for the development of additional well fields, including wells, pipes, and original pumping station equipment, fifteen years.

Section 2. Clause (6) of said section 8 of said chapter 44, as appearing in the Tercentenary Edition, is hereby amended by inserting after the word "diameter", in line 2, the words: ———, and for lining such mains with linings of not less than one sixteenth of an inch, ——— so as to read as follows: ———

(6) For constructing and laying aqueducts and water mains of sixteen inches or more in diameter, and for lining such mains with linings of not less than one sixteenth of an inch, twenty-five years.

Section 3. This act shall take effect as of January first in the current year.

The initial hearing on this bill, introduced as House 496, was held on January 30 and, after amendment and printing as House 2056, interested parties applied all available pressure with a view to effecting its passage into law in advance of the holding of annual town meetings. It was signed into law on February 29.

Chapter 375—AN ACT RELATING TO THE DISPOSITION OF CERTAIN PROPERTY NOW USED FOR WATER SUPPLY PURPOSES IN OR ADJACENT TO THE TOWN OF LINCOLN. This measure, introduced as House 1151, was enacted into law on May 31 and provides a legislative type of option for the town of Lincoln in relation to the property in or adjacent to said town, when, as and if the City of Cambridge, in the future, abandons its source of water supply there.

Chapter 173—AN ACT ESTABLISHING THE FEE FOR THE REGISTRATION OF MOTOR TRUCKS CARRYING PERMANENTLY MOUNTED WELL DRILLING EQUIPMENT. This act, introduced as Senate bill 140, subsequent to change became law on March 25.

Chapter 83—RESOLVE INCREASING THE SCOPE OF THE INVESTIGATION AND STUDY BY THE SPECIAL COMMISSION ESTABLISHED TO MAKE AN INVESTIGATION AND STUDY OF THE ADVISABILITY AND FEASIBILITY OF ESTABLISHING A SOUTHEASTERN MASSACHUSETTS WATER DISTRICT. Based on H-1631, H-2265 was approved as chapter 83 of this year's resolves on July 2. The chapter provides not alone for increase in scope but also extension of time, until December, 1954, for the study and investigation. Appropriations totalling $50,000 have been granted to underwrite the costs.

That portion of S.1, the governor's address, afterward H-1055, A RESOLVE AUTHORIZING THE DEPARTMENT OF PUBLIC HEALTH TO INVESTIGATE AND STUDY THE ADVISABILITY OF REQUIRING THE PLACING OF FLUORINE IN DRINKING WATER, after being reported in Senate 646 on June 17, apparently died there. Likewise S. 555, A BILL RELATIVE TO THE FILING OF SCHEDULES OF WATER RATES, PRICES AND CHARGES OF WATER DISTRICTS WITH THE DEPARTMENT OF PUBLIC UTILITIES, subsequent to adoption of a Senate amendment by the House in concurrence on June 4, was not acted on. S. 559, A BILL FURTHER REGULATING PLANS, SPECIFICATIONS, AND BIDS ON THE CONSTRUCTION, RECONSTRUCTION, ALTERATION, REMODELING OR REPAIR OF PUBLIC BUILDING PROJECTS, was rejected June 16, as was a similar bill in 1951. House 2267—A BILL TO REGULATE COMPETITIVE BIDDING ON PUBLIC BUILDING PROJECTS—was referred to the next annual session on July 2.

In Rhode Island the following measures were enacted into law by the General Assembly:

AN ACT IN AMENDMENT OF CHAPTER 1740 OF THE PUBLIC LAWS, 1946, ENTITLED "AN ACT TO CREATE THE KENT COUNTY WATER AUTHORITY AND TO PROVIDE FOR ITS POWERS AND DUTIES."

Under Section 3, paragraph 10, the original act granted the authority to fix rates and collect charges for the use of facilities or services rendered. About two years ago the Kent County Water Authority revised its rate schedule and a group of indignant property owners obtained a court injunction, preventing the new rates from going into effect. At the January, 1952, session of the General Assembly, under Chapter 2876, the act was amended, which placed the Kent County Water Authority under the jurisdiction of the Division of Public Utilities of the State of Rhode Island.

Additional legislative enactments in 1952 were Chapters 2889, 2917 and 2949, relating respectively to the towns of North Kingstown, North Providence and Portsmouth. Legislation described as H-840, substitute A, is *an Act to incorporate Island Park and Common Fence Point Fire District and to furnish a supply of water within the Town of Portsmouth.*

Respectfully submitted,

(*Signed*) MARK F. CROKER, *Chairman*
WARREN A. GENTNER
WILLIAM A. HEALY
PHILIP J. HOLTON, JR.
EDWIN T. MCDOWELL
EDWARD S. TRACY
PETER C. KARALEKAS

REPORT OF COMMITTEE ON TECHNICAL PROGRAM

June 23, 1952

To the New England Water Works Association:

The report of the Technical Program Committee is herewith presented.

Technical programs were arranged for the five Boston meetings, the June Outing and the Annual Convention. The attendance at the Superintendents' and Chemists' Meetings has been very good during the current year. Credit for the arrangement of these interesting meetings is due Mr. Sherman Rogers and Mr. Kenneth Knowlton.

The matter of competition between the three Thursday meetings, as mentioned in the report of my predecessor, has continued. This statement is made without any sense of criticism because, when the undersigned was Chairman of the Chemists' Round Table, he openly competed with the main meeting for interesting speakers. The attempt has been made to encourage the presentation of papers by superintendents and at four of the Boston meetings a paper was given by a superintendent. All of these papers were interesting and the presence of superintendents on our programs should be encouraged.

The Chairman expresses his appreciation to the members of the Technical Program Committee, the Officers of the Association, and the Secretary's office for their coöperation during the year 1951-52.

(*Signed*) F. E. SMITH, *Chairman*

REPORT OF THE COMMITTEE ON COMMITTEES

To the New England Water Works Association:

During the past year the Committee on Committees was organized the same as the previous year, consisting of the Executive Committee and Warren J. Scott, who has served as Chairman of the Committee on Committees since its inception in 1939.

The Executive Committee recognizes that the proper functioning of the various technical committees is of great importance to the Association, and the present composition of the Committee on Committees has enabled the Executive Committee members to keep in close contact with the committee activities.

The duties of the Committee on Committees are to review the progress of the various committees and make recommendations for the continuance of active committees, and the discharge of those whose duties have been fulfilled, and to propose the establishment of new committees.

Committees to Be Continued

The following committees are those which should be continued, in the opinion of the committee. In practically all instances, the Committee Chairmen have so recommended:

*N.E.W.W.A. 8. Committee on Legislation.

** 9. Committee on Reciprocal Relations with the Institution of Water Engineers (England).

** 11. Committee on Survey of Ground-Water Supplies in New England.

12. Committee on Rainfall and Yield of Drainage Areas.

16. Committee on Coëfficients for Friction in Pipe Lines.

*Expects to submit report at 1952 Annual Convention.

**Expects to submit progress report at 1952 Annual Convention.

** 19. Committee on Water Quality and Treatment.
20. Committee to Report on Developments in Our Knowledge of Corrosion and Its Mitigation.
** 21. Committee on Specifications for Cast-Iron Pipe and Fittings (Sec. Comm. A.S.A.).
** 22. Committee on Reinforced-Concrete Pressure Pipe (Joint A.W.W.A.).
23. Committee on Code for Pressure Piping (Joint A.S.M.E.)
** 24. Committee on Laying Cast-Iron Pipe (Joint A.W.W.A.).
** 25. Committee on Specifications for Steel Pipe (Joint A.W.W.A.).
** 26. Committee on Standardization of Pipe Flanges and Fittings (Sec. A.S.A.).
28. Committee on Steel Standpipes and Elevated Tanks (Joint A.W.W.A.).
* 31. Committee on Hydrant Specifications (Joint A.W.W.A.).
* 32. Committee on Gate Valves (Joint A.W.W.A.).
** 37. Committee on Federal Activities (Joint A.W.W.A.).
** 38. Committee on Fluid Permeability (Sec. A.S.A.).
39. Committee on Deep-Well Vertical Pumps (Sec. A.S.A.).
** 40. Committee on Water-Rate Schedules (Joint A.W.W.A.).
** 41. Committee on Interstate Aid in Civil Defense.
** 42. Committee on Conservation, Development and Utilization of Water Resources.
** 43. Committee on Cost Data for Water Mains and Services.
44. Committee on Publicity.

Discontinuance of Committees and Establishment of New Committees

No committees of the Association were discontinued, as all have incompleted work or new phases of activities planned. During the year two new committees were established, namely:

N.E.W.W.A. 43. Committee on Cost Data for Water Mains and Services.
44. Committee on Publicity.

Conclusions and Recommendations

The Committee on Committees recommends that the committees listed be continued as indicated and that consideration be given to the establishment of a committee to propose specifications for plastic pipes and plastic linings.

The Committee on Committees appreciates the splendid work being carried on by the various technical committees, and desires to cooperate and assist these committees in their various duties and assignments. It will be pleased to receive, for consideration, any suggestions for the establishment of new committees whose activities may result in the furtherance of the water-works profession.

Respectfully submitted,

COMMITTEE ON COMMITTEES

REPORT OF THE COMMITTEE ON RECIPROCAL RELATIONS WITH THE INSTITUTION OF WATER ENGINEERS (LONDON)

September 8, 1952

To the New England Water Works Association:

The Committee on Reciprocal Relations with The Institution of Water Engineers of Great Britain presents herewith its report for the past year:

In 1951 we reported that Vice-President Stanley M. Dore had been awarded the Diploma presented every fourth year by The Institution for an outstanding paper prepared by a member of your Association. Mr. Dore was able to attend the annual meeting of The Institution last May and there present his paper in person.

Your Committee has been instrumental in persuading the distinguished Chief Engineer of the London Metropolitan Water Board, Mr. Henry F. Cronin, to attend this current convention and to present a paper upon the water-works system of the London area. During the past year Mr. Cronin has been elected an Honorary Member of the Association and your Committee takes this occasion to welcome him as a fellow-member.

Respectfully submitted,

(*Signed*) E. SHERMAN CHASE, *Chairman*
LELAND G. CARLTON
PERCY A. SHAW

REPORT OF MEMBERSHIP COMMITTEE

September 5, 1952

To the New England Water Works Association:

There has been an increase in membership from 992 to 1,042 during the past year, making a net gain of 50.

The membership now consists of:

Active members	878
Associate members	129
Corporate members	35
	1,042

Respectfully submitted,

For the Committee,

(*Signed*) GEORGE W. COFFIN, *Chairman*
JOHN J. BAFFA
LENDON F. DUTTON
JOSEPH E. MOORE
HOWARD H. POTTER
JAMES A. SWEENEY
JAMES V. TURNER

REPORT OF COMMITTEE ON SURVEY OF GROUND-WATER SUPPLIES IN NEW ENGLAND

Standardization of Pumping Tests

September, 1952

To the New England Water Works Association:

At a meeting of this Committee in Boston on March 20, 1952, it was voted to study the advisability of standardizing pumping tests on ground-water supplies, conducted for the purpose of determining the quantity and quality of water available for public water-supply purposes.

In order to determine policies and procedures regarding pumping tests in other states, a questionnaire was prepared and sent to all state sanitary engineers. There were 42 returns received and they showed that very few states had definite requirements for pumping tests. The appended tabulation summarizes the data from states where requirements have been established or policies adopted.

The states and territories from which returns were received but which had no requirements regarding pumping tests, except certain requirements on sampling, are as follows: Arkansas, California, Delaware, Florida, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, Missouri, New Jersey, New Mexico, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, Washington, West Virginia, Wyoming, Alaska, Hawaii.

Many of the states reported that recommendations on pumping tests were left to the discretion of the consulting engineer.

It is apparent to this Committee that the New England States, possibly because of topographical and hydrological conditions, regard carefully conducted pumping tests extremely important in the development of suitable sources of public ground-water supplies. Since most public water-supply wells in New England are in glacial till and are less than 100 ft deep, the recommendations of the Committee are made

with these factors in mind. The recommendations for the minimum requirements for pumping tests have been summarized in the last line of the tabulation above referred to. They are outlined in more detail, as follows:

Watershed Area

In selecting an area to be developed for a source of ground-water supply, the apparent watershed area should be carefully considered. While in many cases the watershed area tributary to the wells is much larger than would appear from surface indications, it is believed that an average guide might be about four square miles of watershed area per million gallons of water required, with due regard to the apparent ground-water storage.

Length of Test

The Committee believes that under no conditions should a pumping test be conducted for a period of less than four days. The length of the test should be determined on the behavior of the ground-water table during the test and the hydrological conditions prevailing. During times when there is substantial rainfall during the test, or if the ground-water level fails to stabilize, it may be necessary to continue a test for a period of as long as 30 days.

Period of Pumping at Stabilized Level

The Committee believes that stabilization of the ground-water table should be maintained for at least 24 hours while pumping at a constant rate. It may be necessary to change the rate of pumping in order to maintain a stabilized level.

Number of Observation Wells

There should be at least two observation wells, where the elevation of the ground water may be determined during the period of the test. These wells should be judiciously located with respect to topography and watershed, and should be properly developed so that true ground-water elevations are determined. Where quantities of water in excess of 500,000 gal per day are needed, there should be at least four such observation wells, extending as far as 500 ft from the well or wells being pumped.

Ratio of Pumping Rate to Design Rate

The rate of pumping should be based on the yield of the well or wells, as determined by the drawdown and stabilization of the ground-water table. If possible, sufficient wells should be installed so as to maintain a pumping rate equal to the design rate of the permanent works. If this is not practicable, the rate of pumping may be permitted to be less than the design rate, but in no case should it be less than 50% of the design rate.

Precipitation Records

The Committee believes that it is desirable to maintain rainfall records during the test and during the period of recovery at the site of the pumping test. If there is an existing rainfall station in the same general area, it would be appropriate to use the records from this station, rather than establishing a temporary rainfall station during the pumping-test period.

Drawdown and Recovery Measurements

Drawdown measurements should be made at least once an hour during the initial period of the test from all observation wells. As the test progresses, the frequency of the drawdown readings may be lengthened to as much as four hours. During the period of recovery readings should be taken at least every hour, until the ground-water table begins to stabilize at its static elevation. Recovery readings should be continued until a static elevation is reached, even if this requires an observation period of 7 to 10 days or even longer.

Frequency of Sampling

Samples for chemical analysis should be collected, preferably daily, during the test and at least every other day. Bacterial samples should be collected near the end of the test. Field tests for CO_2, D.O., pH and odor should be made at least twice during the test, preferably near the beginning and near the end.

Disposal of Water Pumped

Water as pumped from the wells should be piped or ditched off the watershed. If this is impracticable, the water should be piped to a point remote from the pumping wells and observation wells, and

State	Length of test (days)	Period of pumping at stabilized level (days)	Number of observation wells	Ratio of pumping rate to design rate	Frequency of sampling Chem.	Frequency of sampling Bact.	Disposal of water pumped	Final acceptance test
Alabama	1	0	0	100%	1	1	75' from wells	Usually one day at design rate
Connecticut	2-7	2-7	—[1]	100%[2]	1	1	50'-100' from from wells[3]	———
Illinois	Variable	Variable	0 to several	100%[4]	2[5]	0	Variable	None if preliminary test is satisfactory
Indiana	1/3-1	—	0	—[6]	—	—	Several hundred feet away	None
Maryland	2+	2	—	100%	1	1	Away from wells	Two days at design rate
Massachusetts	4-20	1+	2 to several	50%	Alternate days	Single	Away from wells	Usually two or more days at design rate[7]
Nebraska	30[8]	1	10	200%[9]	3	1	1,000' away	8 hr at 133% of ultimate capacity
New Hampshire	2-3[10]	1	2	—	2	2	400'-500' away	7 days at 150% of design rate
Ohio	1-2	1	—	—	1	0	———	———
Rhode Island	5	3	1	Max. yield	Daily	Daily	Off watershed	———
Tennessee	Variable	1	0	100%	1	1 or 2	———	None
Committee Recommendations	4	1	2	—[11]	2	1	Away from wells	Two days at design rate

[1]Requires measurement of drawdown.
[2]As close as possible.
[3]Off watershed if possible.
[4]Greater, if possible—variable.
[5]At beginning and end.
[6]Drawdown should not exceed 50-60% of distance from static water level to top of screen.
[7]Not required if preliminary test is satisfactory.
[8]In new areas.
[9]Based on capacity of well.
[10]Or to definite stabilization.
[11]Determined after start of test—not less than 50%.

directed away from all wells, with a view to preventing its return to the well site during the pumping and recovery period.

Final Acceptance Test

In order to substantiate the results of the preliminary test and to test the efficiency of the final installation, a final acceptance test should be conducted for a period of at least 48 hours while pumping at a rate at least equal to the design rate of pumping. Samples for chemical analysis and bacterial examination should be collected near the end of such final acceptance test.

Respectfully submitted,

(*Signed*) RALPH M. SOULE, *Chairman*
JOHN A. BELLIZIA
FRANCIS J. LARIVIERE
HOWARD H. POTTER
WALTER J. SHEA
LESLIE K. SHERMAN
EDWARD L. TRACY

REPORT OF COMMITTEE ON WATER QUALITY AND TREATMENT

September 8, 1952

To the New England Water Works Association:

The present Committee on Water Quality and Treatment was organized in the autumn of 1951. Our activities during the past year have been concerned with the subject of fluoridation of water supplies and a review of other developments in the water-works field related to quality and treatment.

As you know, our Association has not taken a stand along with a number of other professional groups on the matter of fluoridation of water supplies considered to be deficient in this element. This silent attitude has been interpreted in various ways, some of which have not been complimentary to our Association. In considering the various issues involved in this matter, as well as the scientific evidence which has been accumulated in relation to dental-caries prevention, our Committee was of the unanimous opinion that our Association should take a positive stand by adopting a resolution, favoring the fluoridation of water supplies known to be deficient in this element.

Accordingly, the Committee on Water Quality and Treatment prepared a resolution which was presented to the Executive Committee for their approval. The Executive Committee, after some deliberation, returned the resolution to us with the suggestion that a "Statement of Policy", somewhat like that of the American Water Works Association, would seem more appropriate.

A "Statement of Policy" regarding fluoridation was formulated and submitted to the Executive Committee, which, at its meeting in August, failed to support our Committee in this matter.

The Committee on Water Quality and Treatment is of the unanimous opinion that our Association should not stand silent on this issue while opponents to fluoridation snipe at us with half-truths and no truths at all, from behind the cover of various fronts which gains them space in the local papers.

The current controversy as it exists in New England is having serious repercussions in other aspects of water treatment—notably in cases where chemicals are added for corrosion control. The basic point at issue is whether we wish lay-people to dictate water-works practice or whether we as a group consider ourselves of sufficient professional standing to go on record to support those things which seem worth striving for. The members of this Association concerned with the daily operation of our water works deserve our support in every way which will enable them to do the best job possible.

Modern Trends in Water Treatment

Coagulation, Sedimentation and Filtration. The removal of radioisotopes from contaminated water supplies is a subject of considerable research (8), reports of which are appearing from time to time. Difficulties encountered in the photographic industry when using such waters have broadened the scope of this problem.

Corrosion Control. Eliassen and Uhlig (2) have done the water-works profession a real favor in de-bunking the claims for "So-Called Electrical and Catalytic Treatment of Waters for Boilers."

Disinfection. Further evidence of the adequacy of present-day recommended standards for disinfection by chlorine has been presented by Kabler (5).

Analytical. Megregian and Maier (6) have made a significant contribution in standardizing the determination of fluoride in waters. Further studies with molecular filter membranes in bacterial analysis have been reported by Goetz, Gilman and Rawn (4), who have adapted it to field operations.

Taste and Odor. Braus, Middleton and Walton (1) and Middleton, Braus and Ruchhoft (7) have described a method of making fundamental studies on taste and odor problems in water supplies. Gerstein (3) has developed a continuous odor monitor and threshold tester, which should be of interest to those plagued with such problems.

Radiological Monitoring. Developments in the field of continuous radiological monitoring have been unsatisfactory (9).

* * * *

The past year has been a busy one for those concerned with revision of "Standard Methods for the Examination of Water and

Sewage." It is hoped that the new 10th Edition will be published during the coming year.

Respectfully submitted,

(*Signed*) CLAIR N. SAWYER, *Chairman*
GEORGE G. BOGREN
EDWARD S. BROWN, JR.
KENNETH F. KNOWLTON
WARREN J. SCOTT

REFERENCES

1. Braus, Middleton and Walton. Anal. Chem., *23*, 1160 (1951).
2. Eliassen and Uhlig. JAWWA, *44*, 576 (1952).
3. Gerstein, H. A. *Ibid.*, *43*, 373 (1951).
4. Goetz, Gilman and Rawn. *Ibid.*, *44*, 471 (1952).
5. Kabler, P. W. *Ibid.*, *43*, 553 (1951).
6. Megregian and Maier. *Ibid.*, *44*, 239 (1952).
7. Middleton, Braus and Ruchhoft. *Ibid.*, *44*, 538 (1952).
8. Straub, Morton and Placak. *Ibid.*, *43*, 773 (1951).
9. Task Group Report. *Ibid.*, *44*, 583 (1952).

REPORT OF COMMITTEE ON SPECIFICATIONS FOR CAST-IRON PIPE AND FITTINGS

September 8, 1952

To the New England Water Works Association:

Committee A-21 of the American Standards Association, on which your Association is represented by the undersigned, has made substantial progress toward the completion of its assignments. The present status of various documents is as follows:

A-21.1. This is the Manual for the Computation of Strength and Thickness of Cast-Iron Pipe, and is in process of reconsideration, looking toward the addition of data relating to loads under embankment conditions.

A-21.2, A-21.6, and A-21.8. Cast-Iron Pipe for Water or Other Liquids, Pit Cast, Spun in Metal Molds and Spun in Sand-Lined Molds, respectively. These specifications have been cleared by the Committee and submitted to the Sponsors, several of whom have already approved.

A-21.3, A-21.7, and A-21.9. These are specifications for pipe similar to those of the foregoing group, differing only as to the particular requirements of the gas industry. The Committee has cleared these and Sponsor approval is in progress.

A-21.4. The revision of cement-lining specification has been completed, cleared by the Committee and submitted to the Sponsors, such of whom as have responded having taken favorable action.

A-21.10. The specifications for short-body fittings have been approved by all Sponsors and final action by ASA is expected this month.

A-21.11. Mechanical-joint pipe is the subject of a specification which has passed the Committee and has recently been submitted to the Sponsors.

There is reason to believe that next year will see the completion of the work of Committee A-21 and that our next report will be final.

Respectfully submitted,

(*Signed*) RICHARD HAZEN
ARTHUR L. SHAW

REPORT OF COMMITTEE ON REINFORCED-CONCRETE PRESSURE PIPE

During the year a draft of specifications for reinforced-concrete steel-cylinder pipe, prestressed, was reviewed by the committee and prepared for submission to the American Water Works technical committee for acceptance as a tentative standard. When so adopted, we recommend that this Association consider the adoption of these specifications.

There is considerable agitation for the preparation of a draft of specifications for reinforced-concrete pipe, prestressed, but without a steel cylinder. Your committee is strongly in favor and, unless directed otherwise, will urge such preparation.

Respectfully submitted,

(*Signed*) STANLEY M. DORE
GEORGE W. COFFIN
GEORGE A. SAMPSON

PROGRESS REPORT OF COMMITTEE ON LAYING CAST-IRON WATER MAINS

September 4, 1952

To the Members of the New England Water Works Association:

Your Committee on Laying Cast-Iron Water Mains has coöperated with corresponding committees of the AWWA, one concerned with a procedure for disinfecting mains and another with specifications for installation of cast-iron water mains.

The Procedure for Disinfecting Water Mains was published in the February, 1949, issue of the Journal of the AWWA. Numerous changes in this document—amounting to a complete revision—are now being reviewed by committee members.

Specifications for the installation of mains, published in tentative form in the December, 1949, issue of the Journal of the AWWA, omitted jute as an acceptable joint-packing material. Thereafter, the Twisted Jute Packing and Oakum Institute submitted to the Department of Commerce a commercial standard for sterile jute packing. This was not acceptable to the various government agencies.

The tentative specifications for installation of mains, referred to above, omitted the sulfur compounds as a jointing material, though reference to such compounds was made in the notes. Investigation of the sulfur compounds has since been intensified.

Specifications for the installation of pipe having mechanical joints are now under consideration.

Your Committee feels that it should not submit a final report based on procedures and specifications still being revised.

Respectfully submitted,

(*Signed*) W. S. MARINER, *Chairman*

GEORGE W. COFFIN

REPORT OF THE COMMITTEE ON SPECIFICATIONS FOR STEEL PIPE

September 8, 1952

To the New England Water Works Association:

This Committee acts jointly with Committee E7A of the A.W.W.A. on specifications for steel water pipe. During the past year Committee E7A has worked on revisions to Specification 7A.7 for Cement Mortar Protective Coatings for Steel Water Pipe of Sizes 30 Inches and Over, with a view to preparing a separate specification for shop-spun cement-mortar lining and a separate specification for cement-mortar linings applied in place.

Committee E7A has also given consideration to a proposed A.W.W.A. Steel Flange Standard, prepared as a joint activity of the A.W.W.A. and A.S.M.E. Final action has not been taken on either of these matters.

Respectfully submitted,

(*Signed*) THOMAS R. CAMP, *Chairman*
CHESTER J. GINDER

REPORT OF COMMITTEE ON STANDARDIZATION OF PIPE FLANGES AND FITTINGS

September 8, 1952

To the New England Water Works Association:

Your Association is represented by the undersigned on Committee B-16 of the American Standards Association, dealing with pipe flanges and fittings.

The various subcommittees of this committee have been active in the past year in the many directions to which the broad range of its assignments leads. Many of the matters dealt with by Committee B-16 are of limited concern to water-works operators. It is assumed, however, that the membership of NEWWA will wish to be kept informed, in a general way, of the activities in this branch of ASA.

Consideration is being given to the relation between steam-pressure and hydraulic-pressure ratings of flanges and flanged fittings, with particular reference to water at temperatures which would permit it to flash if released by failure. Modification of the 1928 standard to reconcile it with current usage may result.

Specifications B-16.20, for Ring Joint Gaskets and Grooves, and B-16.21, for Nonmetallic Gaskets for Pipe Flanges, have passed through all the necessary steps for adoption and have been issued as American Standards.

Considerable work has been done by subcommittees in the review and revision of numerous standards, to bring them up to date consistently with modern practice. Among these are the specifications for malleable-iron screwed fittings, cast-iron drainage fittings, brass and bronze screwed fittings, and various others.

Substantial progress has been made in the development of standards for solder-joint fittings, flared copper tube fittings, and related subjects.

Respectfully submitted,

(*Signed*) RICHARD HAZEN
ARTHUR L. SHAW

REPORT OF COMMITTEE ON HYDRANT SPECIFICATIONS

To the New England Water Works Association:

The Committee on Hydrant Specifications respectfully submits the following report on its 1951-1952 activities:

A meeting of the Committee was held in Boston during the winter, at which time material specifications and methods of controlling water-hammer were discussed. Conclusions reached at this meeting have been incorporated into the proposed joint NEWWA-AWWA specifications.

A meeting was held in New York City on July 24, 1952, at which the proposed specifications were reviewed with representatives of the Hydrant and Valve Manufacturers Association. Minor changes suggested by the manufacturers' representatives were adopted.

The one remaining issue of importance yet to be cleared is to agree upon a reasonable factor of safety above the 150-175 foot-pounds torque that can be exerted on the operating mechanism by an able-bodied man, using a standard 15-inch hydrant wrench. The manufacturers are re-checking the current design-strength data.

A meeting of the joint committees is scheduled for the end of September, 1952, at which time it is expected agreement on this item can be reached. This should make possible final completion of the work of this Committee.

Respectfully submitted,

(*Signed*) ROGER W. ESTY, *Chairman*
H. W. GRISWOLD

REPORT OF COMMITTEE ON GATE-VALVE SPECIFICATIONS

September 8, 1952

To the New England Water Works Association:

This is the final report of your Gate-Valve Committee.

A new draft of the valve specifications was assembled in the office of the American Water Works Association the latter part of September, 1951, and was sent to the committee members for letter ballot. Your committee was unanimous in not approving this document.

A second draft of the specifications came from the A.W.W.A. office under date of October 31, 1951, and was discussed quite thoroughly by your committee with Mr. Harry E. Jordan, Secretary of the A.W.W.A., at a meeting in Boston on December 20th. Numerous changes were agreed upon there for submission to the other members of the joint committee of the two associations and these were included in a third draft, dated March 3, 1952. On invitation of Mr. Jordan, the chairman of your committee met with about twenty representatives of the valve manufacturers (Manufacturer's Standards Society) in New York on March 5th and the changes in this third draft, made by agreement at that meeting, were embodied in a fourth draft, dated April 4th.

This fourth draft was submitted to the Water Works Practice Committee of the A.W.W.A. at the Kansas City Convention and was approved by them after certain changes had been made. The specifications as approved were forwarded to the Directors of A.W.W.A. and were approved by them as a tentative standard on May 9, 1952. Galley proof of the approved document was sent to the chairman of your committee on June 20th and he returned it to the A.W.W.A. office with certain comments and criticisms.

The specifications for gate valves, approved as a tentative standard by A.W.W.A., seem better than those adopted in 1939 in the following respects:

(1) The arrangement follows a more logical pattern, with the requirements expressed in clearer and more precise language.

(2) Appropriate A.S.T.M. specifications are used for all metal components, and Federal or Army and Navy specifications are used for other material.

(3) For large valves, the emphasis is on steel gears in an oil-tight case, rather than on open cast-iron gearing as at present.

Your committee feels that the following provisions of the specifications are not desirable:

(1) The pressure rating on four- to twelve-inch valves has been increased from 150 psi to 175 psi. Operating pressures in water systems where these valves will be used do not warrant this increase. Flanged ends to the 125-psi standard have been retained with bodies rated at 175 psi. Test pressure, now set at 300 psi, has not been increased, so valves are no longer tested to twice the rated pressure.

(2) Ounce metal is permitted for stem nuts. It seems unsuitable for this service.

(3) Rust-proofed iron stuffing-box glands are permitted. It is believed that these would freeze to the stem after some years of use.

(4) The operating nut is cut away on one side to permit the tightening of the gland-bolt nuts by special wrench through the valve box, but these nuts can be on iron bolts. We favor brass nuts on brass bolts.

(5) Certain A.W.W.A. members have objected to the high zinc content of the bronzes specified for stems, where valves are to be used in systems having lime-softened water, distributed with a high pH. We believe that this should receive further study.

Your committee plans to forward page proof of the A.W.W.A. tentative specifications to the Executive Committee of this Association with the following recommendations:

(1) That the gate-valve specifications adopted as tentative by A.W.W.A. be adopted as a tentative standard by the New England Water Works Association; this for the reason that they are adopted already by the A.W.W.A. and it is undesirable to have two standards for water-works valves, even for short periods.

(2) That the specifications remain tentative until the objections

of your committee as listed above are disposed of to the satisfaction of the Executive Committee and the membership.

(3) That your Gate-Valve Committee be discharged.

Respectfully submitted,

(*Signed*) HAROLD W. GRISWOLD, *Chairman*
LELAND G. CARLTON
WALTON H. SEARS

PROGRESS REPORT OF COMMITTEE ON FEDERAL ACTIVITIES

To the New England Water Works Association:

The newly established Facilities Protection Board established by the President is an Interdepartmental Committee with membership from the Department of Commerce, the Department of Defense, the Department of Interior, the Department of Labor, Federal Civil Defense Administration and the National Security Resources Board.

The purpose of the Board is to secure industry security as relating to national defense. The Facilities Protection Board has classified the water-works industry as one of the fourteen essential industries in case of disaster or major emergency in this country. In fact, it rates tentatively as No. 8 in priority. As a result, that Board requested the Public Health Service to form a Task Group for the purpose of developing security principles for water-works industries.

The Task Group was composed of twelve members, including a representative from the New England Water Works Association and a representative from the American Water Works Association. The Chairman of this Committee was the New England Water Works Association representative. The Task Group has held two meetings in Washington, one on May 19 and one on July 14 of this year.

The purpose of the Task Group is to develop the best methods of protection, in so far as security is concerned, of our water supplies against sabotage or direct enemy action. When these security methods are compiled, they will be published in a manual for use by the water systems that are considered critical. The critical water systems will be determined as such by the Industry Evaluations Board, which has been established by the President in the Department of Commerce. In order to develop this security manual, the Task Group has been divided into five sub-committees, each of which is to develop a part of the manual.

Mr. Raymond Faust, Assistant Secretary, A.W.W.A., and the N.E.W.W.A. representative are working on three parts of the proposed manual—namely, Function of Industrial Management, Selection of Critical Facilities and Hazards. The first preliminary draft of the manual has been completed, but another meeting has been scheduled to be held in Washington some time during the month of October.

(*Signed*) CLARENCE I. STERLING

REPORT OF COMMITTEE ON FLUID PERMEABILITY

(New England Water Works Association, Member of Sectional Committee on Fluid Permeation Z-59 of the American Standards Association)

In November, 1951, the Committee members were given the results of opinions canvassed regarding the Darcy unit of permeability and a suggested modification, 25 of 34 voting for the modification.

The Committee now is preparing temporarily to lay aside the question of establishing a standard unit of permeability and its mathematical symbol, and to turn to a consideration of two other objectives of the Committee, as follows:

(a) To define the term "permeability" and outline the mechanics of fluid permeation.

(b) To rename other terms of fluid permeation that have been called "permeability" in the past.

Respectfully submitted,

(*Signed*) STANLEY M. DORE

REPORT OF COMMITTEE ON WATER RATE SCHEDULES

To the New England Water Works Association:

This is a preliminary report of a committee set up to report on "water rates" and to work with a similar committee of the A.W.W.A., established for the same purpose.

At least two other Rate Committees have reported to the N.E. W.W.A.: the Coffin Committee in 1905 and the Allen Hazen Committee in 1914. The Francis Coffin report of 1905 proposed a service charge plus established rates for all water used. Their recommendation was that this service charge be dependent on the frontage of the property. This was a radical change in method and resulted in its having comparatively little use.

The committee of which Allen Hazen was Chairman, reporting in August, 1914, attempted to set up a schedule which "may be adopted with a minimum disturbance to existing rate conditions". This report proposed a sliding scale with three blocks or rates. They set up quantities of water used per annum, per quarter and per month, to which the three rates are applicable and which are defined and made uniform. A service charge is provided, as in the Coffin report, but rests on a different basis. The three steps into which they divided their rates were: domestic rate for 10,000 cu ft per quarter, an intermediate rate for 10,000 to 100,000 cu ft per quarter and a manufacturers' rate for water used in excess of 100,000 cu ft per quarter. They felt the manufacturers' rate should generally be not less than one-half the domestic rate. They also approved a flat charge for all water used, provided it was combined with a proper service charge. However, they admitted that an adequate service charge imposed a burden on the small user and advised letting the large consumer carry part of the excessive cost of supplying the small consumers.

Many cost items and conditions affect the rate schedules and the required revenue of both privately and publicly owned water works. These items include the following:

"Treatment" of the water
Pumping and power costs
Elevated storage
Load curve; that is, peak loads
"Free water"
Taxes paid
Direct aid to and from the city government
Method of financing improvements
Fire-service costs
Extension program—how financed
How services installed are paid for
Cost of money for improvements, or
"a pay-as-you-go policy"

In a few areas of the rate-schedule problem, the majority of water engineers seem to be in agreement. Most agree:

That rates should be high enough to produce revenue which will enable the utility to serve its customers with an adequate supply of potable water and to keep its capacity-to-serve ahead of the demand. This is hardly debatable.

That the sale of water should be by meter, rather than at flat rates, except possibly for unlimited gravity supplies.

That the rates should be reduced as the quantity taken increases, by blocks, with few blocks—usually not over four.

That a minimum charge, rather than a service or "readiness to serve" charge, is generally agreed to be more acceptable to customers, even though the service charge plus a water or commodity charge may be more correct and logical.

As a matter of fact, a "readiness to serve" charge which includes all the costs included under the definition of a "readiness to serve charge", as given in the A.W.W.A. "Water Works Practice", produces a charge against the small consumer so high that few care to levy it.

Areas of disagreement are so much more numerous as to make any definite recommendations as to how rates should be computed very difficult indeed. There is much disagreement over how sufficient rates are to be secured, what class of consumer should pay what proportion of the costs, what share public and private fire service should bear and how to determine that share, whether public water works should pay taxes and whether they in turn should be paid for

all municipal service rendered. Many a water-works man will argue heatedly for some type of rate and then admit that his utility uses an entirely different method. Why? Largely because changes in methods of charging are hard to explain to the public and are not popular; in other words, in spite of fine theories, *custom controls!*

Much study of the question of establishing water rate schedules emphasizes the areas of disagreement among water-works men. Testifying to this statement is the fact that the A.W.W.A. Committee on Rates, after three years of conference and correspondence, has made only a preliminary report, written by the Chairman (A.W.W.A. Journal, September, 1951).

Your Chairman believes that the best a rate committee can do is to discuss the fundamentals relating to water rates, with some general recommendations of policy toward which the industry may work, as they have worked toward the recommendations of the Coffin and Hazen Committees in their time. Such recommendations this committee hopes to be able to make later.

Respectfully submitted,

(*Signed*) PERCY A. SHAW, *Chairman*
EDWIN T. MCDOWELL
WARREN A. GENTNER

REPORT OF THE COMMITTEE ON CONSERVATION, DEVELOPMENT AND UTILIZATION OF WATER RESOURCES

To the New England Water Works Association:

The Committee on Conservation, Development and Utilization of Water Resources was appointed by the Executive Committee in August, 1951, to follow developments in Federal legislation in connection with water resources, in order that the Association might take appropriate action.

The establishment of this Committee was deemed particularly advisable in view of the controversial recommendations in the report of the President's Water Resources Policy Commission, released on December 11, 1950, and subsequent dates. Legislation to carry these recommendations into effect was submitted to the President by his Commission on February 12, 1951, but was not made public. The President, after study, concluded that this legislation was too controversial, and directed the Bureau of the Budget to make a thorough study of the reports of the Commission and draft appropriate legislation.

This was the situation when this Committee reported at the 1951 Annual Convention of the Association. Included in the Committee's report was a resolution, setting forth the views of the Association in regard to a national water policy, and directing and empowering the Executive Committee to take action for the Association consistent with the resolve. This resolution was unanimously adopted by the Association on September 10, 1951.

There were reports circulating in January, 1952, that the Bureau of the Budget had completed drafting legislation for consideration by the President and that it might be introduced into the second session of the 82nd Congress. The contents of this legislation were not available. However, in conformity with the intent of the resolution adopted at the 1951 Annual Convention, the Executive Committee sent a communication to the New England members of the Congress, setting

forth the attitude of the Association in regard to water resources and expressing apprehension of legislation which might be introduced into Congress.

On February 18, 1952, the confidential legislation submitted over a year previously to the President by his Water Resources Policy Commission was released by that Commission. This legislation, as anticipated, was at considerable variance in many instances with the viewpoint of the Association and the Engineers' Joint Council. At that time it was announced that the legislation of the Bureau of the Budget would be made available within a few weeks; however, the legislation of the Bureau has never been made public, but is reported to have been submitted to the President.

The matter of a national water policy will unquestionably be considered by the 83rd Congress when it convenes in January, 1953. In accordance with the desires of the Association, this Committee will follow this matter very closely and advise the Executive Committee of any action which may appear to be advisable.

Respectfully submitted,

(*Signed*) THOMAS R. CAMP, *Chairman*
BYRON O. MCCOY
JOSEPH C. KNOX

REPORT OF COMMITTEE ON COSTS AND CHARGES FOR INSTALLING MAINS AND SERVICES

September 5, 1952

To the New England Water Works Association:

A questionnaire has been drawn up and approved by all the members of the Committee and is now in the process of being printed. Copies of this questionnaire will be mailed shortly to all operators who are members of the Association.

The Committee hopes that these will be filled out promptly and returned, so that the results can be tabulated and a final report made to the Association.

Respectfully submitted,

(*Signed*) KENNETH W. ROBIE, *Chairman*
EVERETT O. BOOTHBY
THEODORE L. BRISTOL
FRED P. STRADLING
JAMES A. SWEENEY

COMMITTEES OF THE NEW ENGLAND WATER WORKS ASSOCIATION, 1952-1953

N.E.W.W.A.— 1. *Committee on Technical Programs:* Fred E. Smith, *Chairman,* Clarence L. Ahlgren, Henry Campbell, Clifton E. Hodgdon, George C. Houser, Paul F. Howard, John W. Hughes, Kenneth F. Knowlton, Robert W. Moir, Sherman L. Rogers and Marshall S. Wellington.

2. *Committee on Northern New England Meeting:* Peter C. Karalekas.

3. *Committee on Southern New England Meeting:* George Wood.

4. *Committee on Finance:* Harold J. Toole, *Chairman,* Thomas S. Lawrence and George N. Watson.

5. *Committee on Membership:* George W. Coffin, *Chairman,* John J. Baffa, Lendon F. Dutton, Joseph E. Moore, Howard H. Potter, James A. Sweeney and James V. Turner.

6. *Committee on Library:* Ariel A. Thomas, *Chairman,* and Edwin B. Cobb.

7. *Committee on Committees:* Stanley M. Dore, *Chairman,* Frederick O. A. Almquist, Thomas R. Camp, William B. Duffy, Scott Keith, Allan F. McAlary, William P. Melley, Roger G. Oakman, Warren J. Scott and Edward L. Tracy.

8. *Committee on Legislation:* Mark F. Croker, *Chairman,* Warren A. Gentner, Wilfred C. Gilbert, William A. Healy, Philip J. Holton, Jr., Peter C. Karalekas and Edwin T. McDowell.

9. *Committee on Reciprocal Relations with the Institution of Water Engineers* (England): E. Sherman Chase, *Chairman,* Leland G. Carlton and Percy A. Shaw.

10. *Committee on Classification of Water Works Employees and Salaries:* (Temporarily inactivated).

11. *Committee on Survey of Ground Water Supplies in New England:* Ralph M. Soule, *Chairman,* John A. Bellizia, M. L. Brashears, Jr., Henry N. Halberg, Francis J. Lariviere, Howard H. Potter, Walter J. Shea, Leslie K. Sherman and Edward L. Tracy.

12. *Committee on Rainfall and Yield of Drainage Areas:* Francis H. Kingsbury, *Chairman,* John A. Bellizia, Allan T. Gifford, Peter C. Karalekas, Karl R. Kennison, Harvey B. Kinnison, Francis J. Lariviere, Ralph M. Soule, Miner R. Stackpole, Howard M. Turner and William A. D. Wurts.

16. *Committee on Coëfficients for Friction in Pipe Lines:* Richard H. Ellis, *Chairman,* E. Shaw Cole, Allan T. Gifford, F. W. Haley and Byron O. McCoy.
19. *Committee on Water Quality and Treatment:* Clair N. Sawyer, *Chairman,* George G. Bogren, Edward S. Brown, Jr., Kenneth W. Knowlton and Warren J. Scott.
20. *Committee to Report on Developments in Our Knowledge of Corrosion and Its Mitigation:* J. Carrell Morris, *Chairman,* Herman Burgi, Jr., Donald C. Calderwood, Thomas R. Camp, Richard H. Ellis, I. Laird Newell, Ellis A. Tarlton and Frank J. Thiery.
21. *Committee on Specifications for Cast-Iron Pipe and Fittings* (Sectional Committee under American Standards Association): Arthur L. Shaw and Richard Hazen.
22. *Committee on Reinforced Concrete Pressure Pipe* (Joint with American Water Works Association): Stanley M. Dore, *Chairman,* George W. Coffin and Herman G. Dresser.
23. *Committee on Code for Pressure Piping* (Joint with American Society of Mechanical Engineers): Thomas F. Wolfe.
24. *Committee on Laying Cast-Iron Pipe* (Joint with American Water Works Association): William S. Mariner, *Chairman,* and George W. Coffin.
25. *Committee on Specifications for Steel Pipe* (Joint with American Water Works Association): Thomas R. Camp, *Chairman,* and Chester J. Ginder.
26. *Committee on Standardization of Pipe Flanges and Fittings* (Sectional Committee under American Standards Association): Arthur L. Shaw and Richard Hazen.
28. *Committee on Steel Standpipes and Elevated Tanks* (Joint with American Water Works Association): George A. Sampson, *Chairman,* Herman Burgi, Jr., Henry E. Halpin and Joseph C. Lawler, Jr.
31. *Committee on Hydrant Specifications* (Joint with American Water Works Association): Roger W. Esty, *Chairman,* and Harold W. Griswold.
32. *Committee on Gate Valves* (Joint with American Water Works Association): Harold W. Griswold, *Chairman,* Leland G. Carlton and Walton H. Sears.
37. *Committee on Federal Activities* (Joint with American Water Works Association): Clarence I. Sterling, Jr.
38. *Committee on Fluid Permeability* (Sectional Committee under American Standards Association): Stanley M. Dore.
39. *Committee on Deep-Well Vertical Pumps* (Sectional Committee under American Standards Association): Scott Keith.

40. *Committee on Water Rate Schedules* (Joint with American Water Works Association): Percy A. Shaw, *Chairman,* Warren A. Gentner and Edwin T. McDowell.
42. *Committee on Conservation, Development and Utilization of Water Resources:* Thomas R. Camp, *Chairman,* Joseph C. Knox and Byron O. McCoy.
43. *Committee on Cost Data for Water Mains and Services:* Kenneth W. Robie, *Chairman,* Theodore L. Bristol, John P. Hennings, Fred P. Stradling and James A. Sweeney.
44. *Committee on Publicity:* Peter C. Karalekas, *Chairman,* Clarence L. Ahlgren, Charles B. Hardy, William H. McGuinness and William A. D. Wurts.

BOOK REVIEW

WATERWORKS BYELAWS AND FITTINGS. *By Delwyn G. Davies.* 280 pp. London, England: The Colliery Guardian Company, Ltd., 1952. 30 shillings.

This volume forms a standard reference book covering British water-works byelaws and fittings. (A byelaw is "an ordinance affecting the public, . . . imposed by some authority clothed with statutory powers ordering something to be done or not to be done, and accompanied by some sanction or penalty for its non-observance.") The book will be of practical value to engineers, managers and clerks of water works, sanitary inspectors, architects and plumbers.

The first part of this volume contains a historical survey of byelaws and fittings; the conflict between justice, freedom and science; the legislative powers of water authorities; the procedure in the making of byelaws; the present code of byelaws and their limitations; domestic water demands and insufficiencies of supply; British Standards; regulations, the testing of fittings and access to premises; waste, undue consumption, misuse, erroneous measurement, contamination and reverberation (water-hammer); and byelaws for the prevention of pollution. The second part provides a detailed annotation to the Model Byelaws, with the technical and legal issues associated with them. Much engineering information on fittings is presented and their respective merits and demerits are analyzed. The last part of the book contains a typical report seeking prohibition of certain materials, together with a 22-page index. There are 26 illustrations in the volume.

GEORGE C. HOUSER

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Revisions to Steel Water Tank Standards

Extensive revisions to the AWWA-NEWWA standards for steel water tank construction (D100) and also inspection, repair, and repainting (D101), were approved by the Board of Directors on May 9, 1952. In brief, what has been done is to bring the standards up to date, and to separate the sections dealing with painting in both standards to make a third document, D102. Copies of the revised documents will be made available from AWWA headquarters. A general summary of the changes made in the various sections of each standard is given below:

AWWA D100–52 (*formerly* 7H.1)—Standard Specifications for Elevated Steel Water Tanks, Standpipes, and Reservoirs:

1.2. Definitions have been clarified, and welding terms have been brought into line with the latest AWS definitions.

2. Material specifications have been brought up to date.

2.4. Shell plate specifications have been revised to permit the use of plates ordered to the weight basis instead of the thickness basis because the shell plate design unit stresses are quite conservative.

2.11. Gas welding has been deleted because it is never used in the construction of water storage tanks.

3.2.3. Snow loading may be deleted for tanks located where snow loading is insignificant.

3.2.4. Wind loading has been clarified.

8.2. Automatic submerged arc welding is permitted.

3.2.5. Earthquake loading has been slightly modified and clarified.

3.3. Some unit stresses have been slightly modified.

3.5.2. Unit stresses for tubular compression members have been clarified and amplified.

3.5.3. Tubular compression member tolerances have been added.

3.11. Minimum thickness of material has been amplified.

3.12. Staggered joints in shell plates have been modified.

3.13. Riveted dimensions have been slightly modified.

6.2. Silt stop provision has been modified.

6.3. Overflow provisions have been modified.

6.6. Round roof hatches are permitted.

7.3. Round roof hatches are permitted.

7.7. Riser pipe safety grating has been modified.

7.8. Silt stop provision has been modified.

7.9. Overflow provisions have been modified.

8.2.1. Qualification of automatic welding procedure has been added.

8.2.6. Qualification of automatic welding operators has been added.

8.7.1. Restrictions for the location and handling of lap joints in tank bottoms and under the tank shell have been added or revised.

8.7.2. Butt welding of tank bottoms has been revised to conform with the strength of lap welded joints.

8.8. Shell to bottom joint welding has been made a little more restrictive.

8.9.1. Butt welding is permitted for roof plates.

9.8. Forming of tank shell plates has been made more restrictive.

10.18. Grouting and flashing of tank bottoms has been revised.

13. Field painting specifications have been completely removed to Specifications D102.

A22. Concrete specifications have been revised to bring them up to date.

AWWA D101–52 (*formerly* 7H.2)—**Tentative Recommended Practice for Inspecting, Repairing, and Repainting Elevated Steel Water Storage Tanks, Standpipes, and Reservoirs:**

B–2. Revision of terms for extra work has been made.

B–6. Cleanliness section has been revised.

Part C. Entire painting section has been removed to Specifications D102.

Future printings of tank specifications will include the painting specifications, D102, bound into the same booklet with either D100 or D101. The D100–D102 combination will sell for 65¢; D101–D102 is priced at 35¢. Both are available from the AWWA office, 521 Fifth Ave., New York 17, N.Y.

Users of these documents will also be interested in the revision, just published, of the American Welding Society's "Rules for Field Welding of Steel Storage Tanks—D5.1–52" which now includes material on the qualification of welding procedures and welding operators for automatic welding. Copies may be obtained from AWS, 33 West 39th St., New York 18, N.Y., at a price of 50¢ each.

AWWA D102-52T

Tentative

Recommended Practice

for

PAINTING AND REPAINTING ELEVATED STEEL WATER STORAGE TANKS, STANDPIPES, AND RESERVOIRS

This "Tentative Recommended Practice" is based upon the best known experience and is intended for use under normal conditions. The procedure is not intended for unqualified use under all conditions. The propriety of following this procedure in any water utility must be reviewed by the authorities responsible for the maintenance of water works facilities in the locality concerned.

American Water Works Association
New England Water Works Association

Approved by the AWWA Board of Directors as "Tentative" May 9, 1952; and by NEWWA on March 20, 1952

AMERICAN WATER WORKS ASSOCIATION
Incorporated
521 Fifth Avenue, New York 17, N.Y.

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Note

Committee Personnel

This procedural document has been prepared by a standing joint committee representing the American Water Works Assn., the New England Water Works Assn., and the American Welding Society. The committee consists of:

H. O. HILL, *General Chairman*

AWWA	NEWWA	AWS
H. O. HILL	H. E. BAILEY	BRYAN BLACKBURN
L. R. HOWSON	HERMAN BURGI JR.	H. C. BOARDMAN
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Tentative Recommended Practice for

Painting and Repainting Elevated Steel Water Storage Tanks, Standpipes, and Reservoirs

Introduction

This recommended practice has been prepared by a joint committee of the American Water Works Assn. and the New England Water Works Assn. In developing this "Recommended Practice for Painting and Repainting Elevated Steel Water Storage Tanks, Standpipes, and Reservoirs" the associations make available to their members an outline of methods which, in the opinion of their committees, may properly be followed.

The principles which the committees feel that the tank owner should follow in painting or repainting a tank * are listed below. When the term "owner" is used, it may be taken to mean the person or corporation owning the works; the manager or superintendent of the water department or company; the water board or commission; the city council; or the mayor—that is, whoever is responsible for contracts made by and on behalf of the water utility, whether publicly or privately owned.

A. Painting new tanks:

1. The owner should write to any tank painting firm which he wishes to bid on a job, requesting that a quotation be submitted. Plans showing dimensions and the construction of the tank should be furnished with the invitation for bids.

2. The tank builder should be permitted to submit a quotation for the painting.

B. Repainting old tanks:

1. The tank owner should have an inspector examine the metal surface inside and out, to determine the condition of the paint and metal surfaces, and what cleaning and repainting are necessary.

2. The owner should invite any tank painting firm which he wishes to bid on the job to inspect the tank at the same time the inspector does, so that the prospective contractors have full information concerning the conditions.

3. The owner, following proper notification, shall have the tank emptied for the inspector in order that the inside of the roof, sides, and bottom of the tank will be properly exposed for inspection. The inside surfaces shall be thoroughly washed down by the owner to remove slime from wall surfaces and loose deposits and dirt from the tank bottom before the inspector arrives. *This is essential.*

4. The owner should not combine proposals for repair work and painting in one document. He should always be free to award separate contracts if he desires.

5. The owner should not permit any bidder to condition one part of the operations upon another part—for example, the owner should not permit a repainting contract to bear any conditions, reservations, or cancellations of

* The word "tank" is used hereinafter broadly in place of the lengthy phrase "elevated steel water storage tanks, standpipes, and reservoirs."

customary guarantees dependent upon the same bidder's receiving the contract for repairs.

6. The owner should, however, include in his proposal a provision that, if the contracts for repairs and for repainting are granted to the same contractor, the contractor shall record the amount which he will deduct from the sum of the two independent bids. (The price for the combination job should be less by the stated amount than the sum of the same contractor's bids for separate jobs.)

7. The owner should compare all bids received to see whether a separate bid by one contractor for repairs and a separate bid by another contractor for repainting total less than the adjusted bid in (6) above. If the saving is material, and if both the contractors are known to be reliable, separate contracts should be let.

C. General

1. The owner should draw up his own proposals for the work to be done and request bids on the work. He should have the proposals approved by his attorney.

2. The owner, particularly if a municipal department, should arrange for public review of bids and for public letting of contracts.

3. Although the use of the contractor's contract forms is not recommended, if the owner chooses to engage in letting contracts for painting on contract forms other than his own, he should first submit them to his attorney, asking him to study them carefully to see:

a. that no unlimited price commitments are included in the contract form;

b. that no commitments or guarantees by the contractor are conditioned upon any matters not clearly and specifically set forth in the contract;

c. that no obligations are incurred by the owner which are not specifically set forth in the contract; and

d. that a clause covering possible extra work is included in the contract form and is of the same general character and equally as specific as that included in Sec. 1.6 of this "Recommended Practice for Painting and Repainting Elevated Steel Water Storage Tanks, Standpipes, and Reservoirs."

Referring to 3a above, it is clearly in the interest of equitable business practice that, if the owner and the contractor agree to permit or authorize the contractor to do some unscheduled repair work incidental to painting, this repair work should not be of such extent as to make the painting cost minor by comparison. Again, upon the assumption that a tank owner may choose to disregard the recommendations for prior inspection outlined above, he can properly, and should, stipulate that the total of unscheduled repairs shall not cost more than a given amount, such as the total of the painting contract.

Referring to 3b and 3c above, it is observed that, if extended beyond one year, guarantees of repair or painting work done involve uncertainties which are not necessarily in the interest of either the tank owner or the contractor. Frequent and periodic inspection of a water tank is proper and useful, but it should not result in the owner's commitment to a contract for work to be done at an uncertain future date or at a price not arrived at by proper competition.

By the issuance of this procedural document, it is not implied that water departments or companies are not, on their own initiative, competent to de-

velop equitable contracts. Neither is it implied that any member of the associations involved is required to use the procedure herein outlined. The associations have no power or intent to stipulate that a precise procedure must be followed in any aspect of water works operation and maintenance. The associations, likewise, are not in position to police the entire field of contractual operations of water departments and companies. They must content themselves with providing for their members what is considered the best information available on any subject which is documented. It must remain with the responsible executives in the water department or company to protect the interest of the community which they serve.

Section 1—Contractual Arrangements

Sec. 1.1—Repairs Not Included

Repainting contracts shall cover no repair work. No payments for repair work shall be made under painting contracts.

Sec. 1.2—Damage to Tank

The repainting contractor shall use care in his work not to injure the tank in any way. He shall use no hammer on the tank in excess of 3 lb in weight. If, in the process of removing old paint or carrying out the work specified in the contract, any leaks develop, the owner shall have the leaks repaired. It is expressly understood that the painting contractor shall not claim nor shall the owner be liable for costs resulting from the delay in having the repair work done, but the owner shall use diligence in having the repair work done promptly.

Sec. 1.3—Work to Be Done

The contractor shall commit himself to furnish all labor, machinery, tools, rigging, brushes and all cleaning and painting materials necessary to clean and paint the structure in strict conformity with the requirements of the owner's specifications.

Sec. 1.4—Inspection Record

If the owner has had the structure inspected he shall make the inspector's report of condition of the paint available to the bidders. The owner, upon request, shall give prospective bidders ample opportunity to conduct their own inspection in order to verify the inspection covered by the report.

Sec. 1.5—Lump Sum Bids

Bids shall be on a lump sum basis, including all the contractor's costs, such as transportation, labor, tools, equipment, materials, insurance, delays, or other costs of any nature growing out of the painting work defined above.

Sec. 1.6—Extra Work

No payment shall be made for any work other than the lump sum amount bid by the contractor, except upon written order of the owner or his authorized representative, prior to the beginning of the work for which extra compensation is to be requested. When extra work is so authorized, it shall be based upon an agreed lump sum or unit price; or compensation therefore shall consist of the actual cost of materials used in the extra work, plus the cost of all labor, together with the prorated cost to the contractor for the time actually spent on the extra work by the job foreman; plus rental of equipment not on hand at the site of the work, and which was necessary for the extra work involved, the neces-

sity of both such equipment and its rental cost being subject to acceptance by the tank owner; plus power, fuel, water, and similar operating costs; plus incidental expenses incurred as a direct requirement of the extra work, including payroll taxes, workmens' compensation and other insurance based on payroll costs, and any increase in bond premium cost chargeable to the increase in contract amount as a result of the extra work. To the above shall be added 15 per cent to cover administrative cost and contractor's profit, which percentage shall be the only amount to be paid in addition to above mentioned costs. No claim shall be made for delays caused by extra work.

Section 2—General

The purchaser shall specify the method of cleaning the steel and the type or make of paints or coating materials to be used. The various methods of cleaning and types of paint hereinafter described in Sec. 3 to Sec. 7, inclusive, are believed to represent good practice.

Section 3—Preparation of Surfaces

Sec. 3.1—Clean Surfaces

Surfaces shall be suitably cleaned before applying paint. The purchaser or owner shall specify the method of cleaning the steel. The following methods are suggested:

Sec. 3.2—New Tanks

3.2.1. *General*

Plates and structural shapes may be cleaned by wire brushing, grit blasting, sand blasting, pickling, or flame dehydrating. If the purchaser specifies that mill scale be removed, and if pickling or blasting is not specified, it shall be understood that only loose mill scale and rust shall be removed by wire-brushing.

3.2.2. *Brush Cleaning*

Plates and structural shapes may be fabricated and then wire-brushed to remove loose mill scale, rust, and other foreign materials. This cleaning may be performed in the shop or in the field.

3.2.3. *Flame Dehydrating*

Plates and structural shapes may be dehydrated in the shop with the oxy-acetylene torch, removing such mill scale as becomes loosened with one application of the torch followed by wire-brushing, after which all parts except contact surfaces and edges to be welded shall be given one coat of inhibitive primer while the parts are still warm.

3.2.4. *Grit and Sand Blasting*

Grit or sand blasting may be applied in the shop or in the field. The operation is to be continued until all rust and mill scale is removed. The grit or sand blasting equipment shall have ample capacity to furnish the required volume of compressed air to operate the blast effectively. The air shall be free of oil or moisture. If sand is used, it shall be principally composed of silica grains. If blasting is performed in the field, provision shall be made to prevent the spreading of sand to adjoining property. Steel grit may be used instead of sand at the option of the contractor. After cleaning, all surfaces shall be wiped free of any resulting dust.

Before any type of primer or paint is applied to the steel surfaces, steps shall be taken, either by circulation of air or by application of heat, to dry the metal surfaces completely. Whatever metal is cleaned on any day shall be coated with primer on the same day.

If rust forms on any blasted surface, the surface shall be recleaned, as necessary, before the application of primer.

3.2.5. *Pickling*

Pickling, if specified, must be performed before the assembly of parts; it is usually performed at the rolling mill or fabricating shop. Pickling shall be continued until all the mill scale has been removed. After pickling, the acid on the steel shall be neutralized and the steel washed, when necessary, in order to leave a surface suitable for painting.

Before any type of primer or paint is applied to the steel surfaces, steps shall be taken, either by the circulation of air or by the application of heat, to dry the metal surfaces completely. Whatever metal is cleaned on any day shall be coated with primer on the same day.

3.2.6. *Rust and Mill Scale Removal*

Primer paints with phenolic and other quick-drying vehicles, to realize maximum protective performance, require the complete removal of rust and mill scale.

Sec. 3.3—Old Tanks

3.3.1. *General*

Plates and structural shapes may be cleaned by wire-brushing, grit blasting, sand blasting, flame dehydrating, or by power-driven scaling tools. Grit blasting, sand blasting, and power-driven scaling tools are the most effective methods of cleaning. All rust, scale, sand, grit, and sediment collected inside the tank bottom shall be entirely removed from the tank and the inside surfaces swept clean. In cleaning elevated tanks, such rust, scale, and other sediment shall be lowered to the ground by acceptable means and disposed of in a manner satisfactory to the tank owner.

3.3.2. *Brush Cleaning*

If the old paint is in good condition, adheres tightly to the steel and is hard and not too thick, it may be left on. All rust, loose mill scale, and loose paint shall be removed by means of scalers or scrapers and wire brushes (preferably power driven), emery cloth or sandpaper, and either air or cloth dusters. Special care shall be used to clean all pits and roughened areas. Where there are blisters or rust, the steel shall be cleaned to bare metal, either by wire brushes and scrapers, or by the use of hand or power sanders. All foreign material, rust, and loose paint shall be removed, and any old paint which has been allowed to remain shall have a clean surface and be tight to the steel.

3.3.3. *Grit and Sand Blasting*

If grit- or sand-blasting equipment is available, or if the condition of the steel is such that the methods described in Sec. 3.2.2. are incapable of properly cleaning the steel preparatory to painting, all surfaces shall be cleaned by grit or sand blasting. The grit- or sand-blasting equipment shall have ample capacity to furnish the required volume of compressed air to operate the blast effectively. The air shall be free of oil or moisture. If sand is used, it shall be composed principally of silica grains. Provision shall be made to prevent the spreading of sand to adjoining property. Steel grit may be used instead of sand at the option of the contractor. After cleaning, all surfaces shall be wiped free of any resulting dust.

Before any type of primer or paint is applied to the steel surfaces, steps shall be taken, either by circulation of air or by the application of heat, to dry the metal surfaces completely. Whatever metal is cleaned on any day shall

be coated with primer on the same day. If rust forms on any blasted surface, the surface shall be recleaned, as necessary, before the application of primer.

Section 4—Painting

Sec. 4.1—Workmanship

All painting shall be performed in a workmanlike manner, by experienced workmen, and in the manner recommended by the manufacturer of such materials. Sufficient time shall be allowed for each coat of paint to dry thoroughly before the following coat is applied.

Sec. 4.2—New Tanks

4.2.1. *Shop Paint*

All plates and structural shapes that are prepared in the shop for painting shall receive a shop coat of an inhibitive steel primer on all parts except contact surfaces. It is advisable, when priming paints are applied in the shop, to prime both the outside and the inside with the same paint.

4.2.2. *Field Paint*

After the tank has been completely erected, and after it has been tested, all surfaces prepared in the field for painting shall receive a coat of an inhibitive steel primer on all surfaces. Materials that received a primer coat of paint in the shop shall be cleaned of dirt, rust, or foreign material, the welding edges or rivet heads shall be carefully cleaned to remove residual scale and weld flux, and any abraded spots and all accessible surfaces which were not painted in the shop shall then be spot coated with the inhibitive steel primer used in the shop, after which the interior and exterior surfaces shall be given the number of coats of paint of the makes or types and colors specified by the purchaser.

Sec. 4.3—Old Tanks

When the old paint has not been entirely removed, after cleaning, all abraded and bare surfaces shall be spot coated with an inhibitive steel primer. If the old paint has been entirely removed, the entire surfaces shall be painted with an inhibitive steel primer, after which the interior and exterior surfaces shall be given the number of coats of paint of the makes or types and colors specified by the purchaser. Only when the old paint is in good condition, except for minor spots which can be touched up satisfactorily with sufficient prime coats to provide adequate film thickness, is a single overall coat acceptable.

Section 5—Selection of Paints and Coatings

Sec. 5.1—Suitability

It is recognized that various types and kinds of paint have, in great measure, demonstrated their suitability for water works use and that no type or kind is universally applicable. Many tank fabricators and consulting engineers have developed paint systems which they have found from long experience to give excellent service. Some types of paint, however, which have, in general, given good service and which are now believed to represent good practice, are given hereinafter.

Sec. 5.2—Interior Surfaces

5.2.1. *General*

The protection afforded by a paint system depends greatly upon the num-

ber of properly applied coats, assuming that each coat is allowed to become thoroughly dry and hard before the application of the following coat or submergence in water. (The total thickness of a paint film is not necessarily an index of its durability. A paint film 0.005 in. in thickness will be more durable if applied in three coats than in two, and far more durable than if this thickness were obtained with one coat. A coat of paint uniformly applied as a normally thin film is desirable because the paint will dry better and become harder between coats than if applied in a thicker film, although more coats will be required for an equivalent total paint thickness.) Considering the matter from the standpoint of cost per year of protective service, it is recommended that a minimum of three coats of paint be used. In addition to facts on paint protection, information is given in Sec. 5.4.4 about hot-applied coal-tar enamel, in Sec. 5.4.5, cold-applied coal-tar coating; and in Sec. 5.4.6, wax-grease coatings. The number of coats and method of application shall conform to the instructions of the manufacturer of the product.

5.2.2. *Old Tanks*

If interior surfaces have previously been unpainted, or if old paint has been completely removed and surfaces have been carefully prepared, a minimum of three coats of paint should be used. Successive coats of the same paint shall be tinted slightly to help indicate proper coverage. On a previously painted surface where the old paint is generally in good condition except for minor failed areas, these areas shall be touched up with two coats of paint and the entire surface shall then be given at least two full coats. (*See* Sec. 5.5.4 for suggested paint specifications.)

5.2.3. *New Tanks*

All interior surfaces of the tank shall be given at least three coats of paint. The first coat may be applied either in the shop or in the field. After erection, the first coat, if applied in the shop, shall be retouched and all seams and other surfaces not painted in the shop, shall be painted with the same kind of paint. At least two additional coats of paint shall be applied. Successive coats of the same kind of paint shall be tinted slightly to help indicate proper coverage. It is advisable, when priming coats of paint are applied in the shop, that both the outside and inside be primed with the same kind of paint. (*See* Sec. 5.4 for suggested paint specifications.)

Sec. 5.3—Outside Surfaces

5.3.1. *Old Tanks*

Outside surfaces from which all the old paint has been removed, should receive one * prime coat and at least one † finish coat of paint. When the old paint on previously painted surfaces is generally in good condition except for minor spots, the spots should be patch-coated with one or two coats of the primer before the application of the finish coat paints. Successive coats of the same paint shall be tinted slightly to help indicate proper coverage. (*See* Sec. 5.5 and 5.6 for suggested paint specifications.)

5.3.1.1. Sealing periphery of flat tank bottoms. After the tank has been

* Many specifiers require an additional field coat of priming paint prior to the application of the finish coats, as this practice considerably prolongs performance.

† If an aluminum or white paint is applied over red lead primer, it is advisable to use two finish coats of aluminum or white paint, in order to obtain proper color coverage; or the color of the primer shall be such that the final color of the finish coat shall not be seriously affected.

completely erected, any space which may exist between the tank bottom and the concrete foundation, and extending for a distance of approximately 1 in. inside the outer edge of the tank bottom, shall be filled with a fibrated cold-plastic coal-tar pitch flashing compound and the entire outer edge of the bottom shall be sealed to the tank foundation with the same material.

5.3.2. *New Tanks*

Outside surfaces, including structural members, with the exception of the underside of flat tank bottoms, should receive one * prime coat and at least one † finish coat of paint. The prime coat may be applied either in the shop or in the field. After erection, the prime coat, if applied in the shop, shall be retouched and all seams and other surfaces not painted in the shop shall be painted with the same paint, after which at least one finish coat shall be applied. Successive coats of the same paint shall be tinted slightly to help indicate proper coverage. (*See* Sec. 5.5 and 5.6 for suggested paint specifications.)

5.3.2.1. Underside of flat tank bottoms and sealing. It is seldom considered necessary to apply any protective coatings to the underside of flat tank bottoms. Bottoms resting on a well-drained sand pad, or on a concrete foundation are practically immune to corrosion from the outside. After the tank has been completely erected, any space which may exist between the tank bottom and the concrete foundation, and extending for a distance of about 1 in. inside the outer edge of the tank bottom, shall be filled with a fibrated, cold-plastic, coal-tar pitch flashing compound, and the entire outer edge of the bottom shall be sealed to the tank foundation with the same material.

Sec. 5.4—Inside Primers and Finish Coats

5.4.1. *Surface Preparation*

Paints using phenolic resin varnish and other fast-drying vehicles (*see* Sec. 5.4.3) are applicable as primers only to well prepared surfaces from which all mill scale and rust have been removed. Surfaces from which all rust and mill scale have not been entirely removed should have a prime coat with a linseed oil vehicle (*see* Sec. 5.4.2) which may be followed by finish coats of the same paint or by paints using phenolic resin varnish or other fast-drying vehicles compatible with the primer vehicle (*see* Sec. 5.4.3).

5.4.2. *Red Lead, Linseed Oil Paint*

Primers of the red-lead, linseed-oil type have good wetting and penetrating characteristics and therefore better assure adhesion to the average, wire-brushed, surface. This primer is also suitable for use on well cleaned surfaces.

This paint shall conform to Federal Specification TT-P-86a, Type I, which requires the use of red lead in a linseed oil vehicle. For interior surfaces, this paint shall be modified by the addition of 2 lb per gal of dry litharge, to be added shortly before application. The dry litharge is to be added slowly while the paint is stirred. Only as much paint shall be treated with litharge as will be used in a working day, as red lead paint, so modified, has limited keeping properties. The inclusion of litharge speeds up the drying, produces

* Many specifiers require an additional field coat of priming paint prior to the application of the finish coats, as this practice considerably prolongs performance.

† If an aluminum or white paint is applied over red lead primer, it is advisable to use two finish coats of aluminum or white paint, in order to obtain proper color coverage; or the color of the primer shall be such that the final color of the finish coat shall not be seriously affected.

a more water-resistant film, and permits recoating within 24 hr.

The paint shall set to touch in not more than 6 hr and shall dry through in not more than 24 hr. Each coat of paint shall dry for at least 24 hr before applying subsequent coats and the final coat shall dry for at least 48 hr before the tank is filled with water.

Paint shall be delivered to the job in original containers marked with the name of the manufacturer and the specification number of paint contained therein. The paint shall not show excessive settling in a freshly opened, full can, and shall be easily redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, livering, caking, or color separation, and shall be free from lumps and skins. The paint as received shall brush easily, possess good leveling properties, and show no running or sagging tendencies when applied at a spreading rate of 500 sq ft per gal to smooth steel vertical surfaces. The paint, when reduced with not more than 1 part by volume of mineral spirits (conforming to Federal Specifications TT-T-291, Grade I) to 8 parts by volume of the packaged material, shall spray satisfactorily, show no tendency to orange-peel, sag, creep, or run, and show satisfactory spraying properties in all other respects. The paint shall not skin within 48 hr in a three-quarters-filled, closed container.

The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness, and other surface imperfections. The paint shall show no streaking or separation when flowed on clean glass. Successive coats of the same kind of paint shall be tinted slightly to help indicate proper coverage.

5.4.3. *Red Lead Phenolic Resin Varnish Paint*

When used as a primer, red lead phenolic resin varnish paint is suitable only on thoroughly cleaned surfaces obtained by pickling or blasting. It is, however, suitable as finish coats on average cleaned surfaces, wire-brushed, and also on thoroughly cleaned surfaces. This paint shall conform to Federal Specification TT-P-86a, Type IV.

Paint shall set to touch in not more than 1 hr and shall dry through in not more than 6 hr. Each coat of paint shall dry for at least 6 hr before applying additional coats and the final coat shall dry for at least 12 hr before the tank is filled with water.

Paint shall be delivered to the job in original containers marked with the name of the manufacturer and the specification number of paint contained therein. The paint shall not show excessive settling in a freshly opened full can, and shall be easily redispersed with a paddle to a smooth, homogeneous state. The paint shall show no curdling, livering, caking, or color separation, and shall be free from lumps and skins.

The paint as received shall brush easily, possess good leveling properties, and show no running or sagging tendencies when applied at a spreading rate of 500 sq ft per gal to smooth steel vertical surfaces.

The paint when reduced with not more than 1 part by volume of mineral spirits (conforming to Federal Specifications TT-T-291, Grade I) to 8 parts by volume of the packaged material, shall spray satisfactorily, show no tendency to orange-peel, sag, creep or run, and shall show satisfactory spraying properties in all other respects. The paint shall not skin within 48 hr in a three-quarters-filled, closed container.

The paint shall dry to a smooth uniform finish, free from roughness, grit, unevenness, and other surface imperfections. The paint shall show no streaking or separation when flowed on clean glass. Successive coats of the same paint shall be tinted slightly to help indicate proper coverage.

5.4 4. *Hot-Applied Coal-Tar Enamel —Inside Coating*

Hot-applied coal-tar enamel inside priming and coating materials shall meet the requirements of the applicable provisions of the latest revision of AWWA C203 and C204, standard specifications for coal-tar enamel protective coatings for steel water pipe. Application must conform to the instructions of the manufacturer of the product. There may be danger in the use of coal-tar enamel for sprinkler systems, for if any tar is loosened by low temperatures or by too much heat it may clog the sprinkler orifices.

5.4.5. *Cold-Applied Coal-Tar Paint —Inside Coating*

Cold-applied coal-tar paint for inside coating is prepared from a plasticized coal-tar pitch, mineral filler, and solvent, and is designated as CA-50, cold-applied coal-tar paint. Although CA-50 does not have the durability of hot-applied coal-tar enamel, it does have certain advantages. It is easily applied by brushing or spraying and specially trained workmen are not required for a satisfactory application. It has excellent adhesion to clean steel and is able to withstand cold temperatures better than the hot-applied enamel. A minimum of 3 coats should be applied. A minimum thickness is considered to be 20 mils, a thickness which can be obtained with three coats, each at 120 sq ft per gal. Each coat should be permitted to dry thoroughly to avoid entrapment of volatiles by succeeding coats. The minimum drying time is 24 hr; in poor drying conditions, four or five days between coats may be necessary. This coating is not suitable for use in open-top tanks which would expose the coating to direct sunlight.

5.4.6. *Wax-Grease Inside Coating*

Wax-grease coatings may be either of the cold application type or of the type adapted for hot application. Application must conform to the instructions of the manufacturer of the product.

Sec. 5.5—Outside Primer

5.5.1. *Surface Preparation*

Paints using phenolic resin varnish and other fast-drying vehicles (*see* Sec. 5.5.3) are applicable as primers only to well prepared surfaces from which all mill scale and rust have been removed. Surfaces from which all rust and mill scale have not been entirely removed, such as the framing of elevated tanks, should have a prime coat with a linseed oil vehicle (*see* Sec. 5.5.2) which may be followed by finish coats of paint with a linseed oil vehicle or by paints using phenolic resin varnish or other fast-drying vehicles compatible with the primer vehicle (*see* Sec. 5.5.3).

5.5.2. *Red Lead Linseed Oil Paint*

Primers of the red lead linseed oil type have good wetting and penetrating characteristics and therefore better assure adhesion to the average wire-brushed surface. This primer is also suitable for use on well cleaned surfaces.

This paint shall conform to Federal Specification TT-P-86a, Type I, which requires the use of red lead in a linseed oil vehicle. The paint shall set to touch in not more than 6 hr and shall dry through in not more than 36 hr. Each coat of paint shall dry for

at least 36 hr before applying subsequent coats.

Paint shall be delivered to the job in original containers marked with the name of the manufacturer and the specification number of paint contained therein.

The paint shall not show excessive settling in a freshly opened full can, and shall be easily redispersed with a paddle to a smooth, homogeneous state. The paint shall show no curdling, livering, caking, or color separation and shall be free from lumps and skins.

The paint as received shall brush easily, possess good leveling properties, and show no running or sagging tendencies when applied at a spreading rate of 500 sq ft per gal to smooth steel vertical surfaces.

The paint when reduced with not more than 1 part by volume of mineral spirits (conforming to Federal Specifications TT-T-291, Grade I) to 8 parts by volume of the packaged material, shall spray satisfactorily, show no tendency to orange-peel, sag, creep, or run, and shall show satisfactory spraying properties in all other respects. The paint shall not skin within 48 hr in a three-quarters-filled, closed container.

The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness, and other surface imperfections. The paint shall show no streaking or separation when flowed on clean glass. Successive coats of the same kind of paint shall be tinted slightly to help indicate proper coverage.

5.5.3. *Red Lead Phenolic Resin Varnish Paint*

When used as a primer, red lead phenolic resin varnish paint is suitable only on thoroughly cleaned surfaces obtained by pickling or blasting. It is suitable, however, as a finish coat on average cleaned surfaces, wire brushed, and also on thoroughly cleaned surfaces. This paint shall conform to Federal Specification TT-P-86a, Type IV.

Paint shall set to touch in not more than 1 hr and shall dry through in not more than 6 hr. Each coat of paint shall dry for at least 6 hr before additional coats are applied.

Paint shall be delivered to the job in original containers marked with the name of the manufacturer and the specification number of paint contained therein. The paint shall not show excessive settling in a freshly opened full can, and shall be easily redispersed with a paddle to a smooth, homogeneous state. The paint shall show no curdling, livering, caking, or color separation, and shall be free from lumps and skins.

The paint as received shall brush easily, possess good leveling properties, and show no running or sagging tendencies when applied at a spreading rate of 500 sq ft per gal to smooth steel vertical surfaces.

The paint when reduced with not more than 1 part by volume of mineral spirits (conforming to Federal Specifications TT-T-291, Grade I) to 8 parts by volume of the packaged material, shall spray satisfactorily, show no tendency to orange-peel, sag, creep, or run, and shall show satisfactory spraying properties in all other respects. The paint shall not skin within 48 hr in a three-quarters-filled, closed container.

The paint shall dry to a smooth uniform finish, free from roughness, grit, unevenness, and other surface imperfections. The paint shall show no streaking or separation when flowed on clean glass. Successive coats of the

same paint shall be tinted slightly to help indicate proper coverage.

Sec. 5.6—Outside Finish Paints

5.6.1. *White, Linseed Oil, Chalking Type Finish Paint*

White, linseed oil, chalking type finish paint shall conform to Federal Specification TT-P-102, Class A. It is a titanium, lead, zinc, and oil, exterior, ready-mixed, white paint. The maximum drying time is 18 hr. Each coat of paint shall dry for at least 18 hr before applying subsequent coats. With chalking white paint, when used on elevated tanks, the dirt may accumulate on the underside of the tank and on the lee side of columns, which leaves dirty streaks. This condition however, is not encountered on standpipes.

5.6.2. *White, Linseed Oil, Nonchalking Finish Paint (for Tints).*

White, linseed oil, nonchalking finish paint shall conform to Federal Specification TT-P-102, Class B. It is a titanium, lead, zinc, and oil, exterior, ready-mixed paint. This paint is usually tinted and is used for light colors but not as a white paint. The maximum drying time is 18 hr. Each coat of paint shall dry for at least 18 hr before the subsequent coats are applied.

5.6.3. *Black, Linseed Oil Finish Paint*

Black, linseed oil finish paint shall conform to Federal Specification TT-P-61a. It is a carbon, red lead, mineral-extender, and, if desired, iron oxide, linseed oil paint. The maximum drying time is 18 hr. Each coat of paint shall dry for at least 18 hr before subsequent coats are applied.

5.6.4. *Aluminum Finish Paint*

Mixing varnish for aluminum paint shall conform to Federal Specification TT-V-81b, Type II, Class B; and aluminum-pigment powder and paste for aluminum paint shall conform to Federal Specification TT-A-468a, Type II paste, Class B.

To 1 gal of aluminum mixing varnish should be mixed 2 lb of aluminum paste. The paint should be mixed the same day that it is used. The aluminum paint may be furnished ready-mixed provided it is equal to the above and also provided that the paint is consumed within six months of its manufacture or is equal in reflectivity to a freshly mixed sample of aluminum paste and vehicle. The paint shall set to touch in not less than 1 hr nor more than 4 hr, and dry hard in not more than 18 hr. Each coat of paint shall dry for at least 18 hr before applying subsequent coats.

5.6.5. *Foliage Green, Linseed Oil Paint*

The following formula is that used by the state of Maine Highway Commission, Bridge Div., for foliage green, linseed oil paint:

Material	Amount
Soft paste white lead	100 lb
Chrome oxide green paste in oil	20 lb
Raw linseed oil	3¼ gal
Varnish	½ gal
Turpentine or mineral volatile spirits and drier	1 qt
Yield (approximate)	8¼ gal

The maximum drying time is 20 hr. Each coat of paint shall dry for at least 20 hr before subsequent coats are applied.

Sec. 5.7—Fibrated, Cold-Plastic, Coal-Tar Pitch Flashing Compound

Fibrated, cold-plastic, coal-tar pitch flashing compound must adhere both to steel and to concrete and have sufficient consistency to fill voids and not run under normal atmospheric conditions.

Section 6—Electric (Cathodic) Protection of Tank Interiors

The electrolytic method of protecting water tank interiors has proved to be satisfactory when properly installed and maintained. Steel surfaces not submerged at least one-half the time, including the underside of the roof, should be properly painted and maintained. For installations in new tanks, paint should be provided for all submerged steel surfaces as, by its electrical resistance, the paint reduces current requirements and lowers cathodic protection installation and operating costs. It is recommended that cathodic protection equipment be purchased directly from the manufacturer of the equipment, and that an arrangement be included for maintenance. The equipment should not be left to operate without frequent and adequate inspection of its operation.

Section 7—Application of Paint and Coatings

Sec. 7.1—Application of Paint

Paints may be applied either by spraying or by brushing. If applied by spraying, care shall be taken that suitable nozzles are used and that the air pressure, both on the liquid in the container and on the atomizing nozzles, is within the ranges recommended by the paint and equipment manufacturers to produce good work. If the spray method is used, care should be taken that no spray falls on nearby structures. Spraying of exterior surfaces shall be confined to quiet days when it will not adversely affect adjacent property. The contractor shall be responsible for any and all damage resulting from drifting of spray. If the paint is applied by brushing, it shall be brushed in one direction and then smoothed in a direction at right angles to the original brushing, to produce as uniform a thickness of coat and as complete a coverage as possible. (This required two-directional brushing is "one coat" within the meaning of this procedure.)

Care should be taken to insure the application of a uniform coating carefully worked around the rivet heads, joints and other irregularities in the surface.

Each coat shall be allowed to dry thoroughly before the next coat is applied. Paint shall be applied only when the air temperature is at or above 40 F. No paint shall be applied during wet or foggy weather, or upon damp surfaces or metals coated with frost.

Sec. 7.2—Application of Coal-Tar Enamels

The surface must be cleaned of mill scale and rust before the application of coal-tar enamels. The detailed recommendations of the manufacturer shall govern the application of coal-tar enamels.

The coal-tar primer shall be evenly applied and care exercised to avoid runs, festoons, or other accumulations of heavy primer. No coal-tar primer shall be applied when the temperature of the steel is below 45 F, or at any time when moisture collects on the steel.

The minimum and maximum allowable drying time of the coal-tar primer between application of the primer and application of coal-tar enamel shall be in accordance with instructions issued

by the manufacturer of the primer unless otherwise directed by the purchaser. If the enamel is not applied within the maximum time, as required by the manufacturer or as directed by the purchaser or owner, the steel shall be reprimed with an additional light coat of primer.

The coal-tar enamel shall be broken into small pieces and heated in a suitable melting kettle. A slow flame shall be used for the initial heating before the flame is turned on full force. When the hot enamel is drawn from the heating kettle, it shall be strained through a fine wire screen to remove all foreign substances. Immediately before applying the hot coal-tar enamel, the primed surfaces shall be wiped free of any dust or foreign matter.

Sec. 7.3—Application of Cold-Applied, Coal-Tar Paint

The surface must be cleaned of mill scale and rust before the application of cold-applied coal-tar paint. This CA-50 appears in the container as a heavy-bodied pastelike material; however, stirring reduces its consistency to a point where it works easily under the brush. It may be applied by spraying with pump type equipment. The first coat, applied directly to the steel without a primer, is usually brushed; subsequent coats are applied by brushing or spraying. It is good practice to apply alternate coats at right angles to insure uniform coating.

Sec. 7.4—Wax-Grease Paints—Cold-Application Type

Cold-application type wax-grease paints shall be thoroughly rubbed on the clean dry metal with a stubby brush to insure thorough wetting of the metal surface and absorption of all occluded moisture. The coating shall be applied to a thickness of not more than 0.03 in. and not less than 0.02 in.

The tank can, if needed, be placed in service as soon as coating is complete.

Sec. 7.5—Wax-Grease Paints—Hot-Application Type

Because of its physical properties and special method of application, it is recommended that the hot-application type of wax-grease paint be applied only by an experienced painting contractor who is properly equipped to handle this material. The material shall be applied to the dry surfaces by means of a spray apparatus, utilizing fluid pressure through special nozzles. Sufficient pressure shall be used to impinge the molten material on the metal surface. The temperature of the coating shall be not less than 250 F and not more than 300 F. After application to the surface, the coating should be thoroughly flashed or flamed by means of a torch, to smooth out all laps and close any pinholes. The thickness of applied coating shall be not less than 0.03 in. nor more than 0.06 in.

Section 8—Ventilation

The contractor must provide adequate ventilation while painting or coating the interior surfaces of a tank. This is particularly important if tar products are used. The ventilation shall be adequate to remove fumes, preventing injury to workmen or the possibility of accumulating volatile gases. Natural ventilation will seldom be effective; therefore, it will usually be necessary to provide forced air ventilation.

Section 9—Cleanliness

The contractor and all workmen employed by him shall conduct all operations in a clean and sanitary manner. No nuisance shall be committed in a tank; the workmen shall either use proper waste receptacles or leave the tank whenever necessity arises. The tank owner, after completion of construction, or after work of any nature is done in a tank, is charged with satisfying himself that the tank interior is clean and sanitary before the tank is placed in, or returned to, service. Although a contractor may be required by his contract to clean all painted surfaces thoroughly before a tank is restored to service, it is the ultimate responsibility of the tank owner either to give the tank a final field inspection or to require such laboratory tests of the quality of water held (for test purposes) in the tank as will demonstrate the good sanitary condition of the tank interior (*see* "Note" covering disinfection procedure at the end of this document).

Section 10—Inspection

The owner shall inspect the painting as it is being done or employ an inspector to do so. Payment for painting shall be made only after the owner has satisfied himself directly that the painting is satisfactory; or after an inspector's report has been filed with the owner certifying that the painting has been done properly and in accordance with the terms of the contract. It is in the interest of both the owner and the contractor that such inspection be made promptly.

Note

Disinfection Procedure. After construction or repairs have been effected and painting has been completed, a tank should be disinfected before it is placed or replaced in service. The tank should be filled slowly to the overflow level with potable water, to which sufficient chlorine is added to provide a concentration of 50 ppm in the full tank. An application of 50 ppm of chlorine to 100,000 gal of water is represented by the following amounts of the more common and available products:

Material	Physical State	Available Chlorine	Quantity Required
		per cent	*lb*
Chlorine	Liquid under pressure in steel cylinders	100	41.5
High-test hypochlorites	Powder in cans	70	60.0

The chlorine, either as high-test calcium hypochlorite or liquid chlorine, should be introduced into the water as early during the filling operation as possible. A simple and effective method of adding the disinfectant consists of making a water mix of the hypochlorite powder (using a minimum of water) and pouring it through the cleanout or inspection manhole in the lower course of a standpipe shell, or in the base of the riser pipe of an elevated tank. The inspection manhole cover should then be bolted into place and the filling of the tank started. If a liquid chlorine and water mixture is used, a special tap may be provided in the cleanout manhole cover and the gas-water mixture pumped into the tank as the filling is started. Filling the tank will provide a thorough mix of the chlorine with the water and assure a contact with all sur-

faces for disinfection. If no bottom manhole is available, the chlorine powder or liquid chlorine and water mixture may be scattered over the water surface in the partly filled tank, working from the roof manhole. After the tank has been filled, it should stand full for 24 hr, if possible, but for not less than 6 hr. (Disinfection with chlorine at the 50-ppm rate is practically instantaneous, if the polluting material is not protected by films or gross particles. The 6- to 24-hr holding requirement is intended to provide a factor of safety.)

After the holding period, the highly chlorinated water in the tank must be completely drained to waste and the tank refilled from the regular supply. After refilling, samples of water should be taken from the tank and tested to demonstrate and record the good sanitary condition of the tank before it is placed in, or restored to, regular service.

Whenever the State Sanitary Engineer requires a specific method of disinfection to be used, the procedure required by him must be followed.

The tank owner and the construction contractor, the repair contractor, or the painting contractor shall, prior to performing any work on the tank reach a definite understanding concerning the disinfection procedure to be used, and shall assign responsibility for the actual task of disinfection, recording this understanding in the contract.

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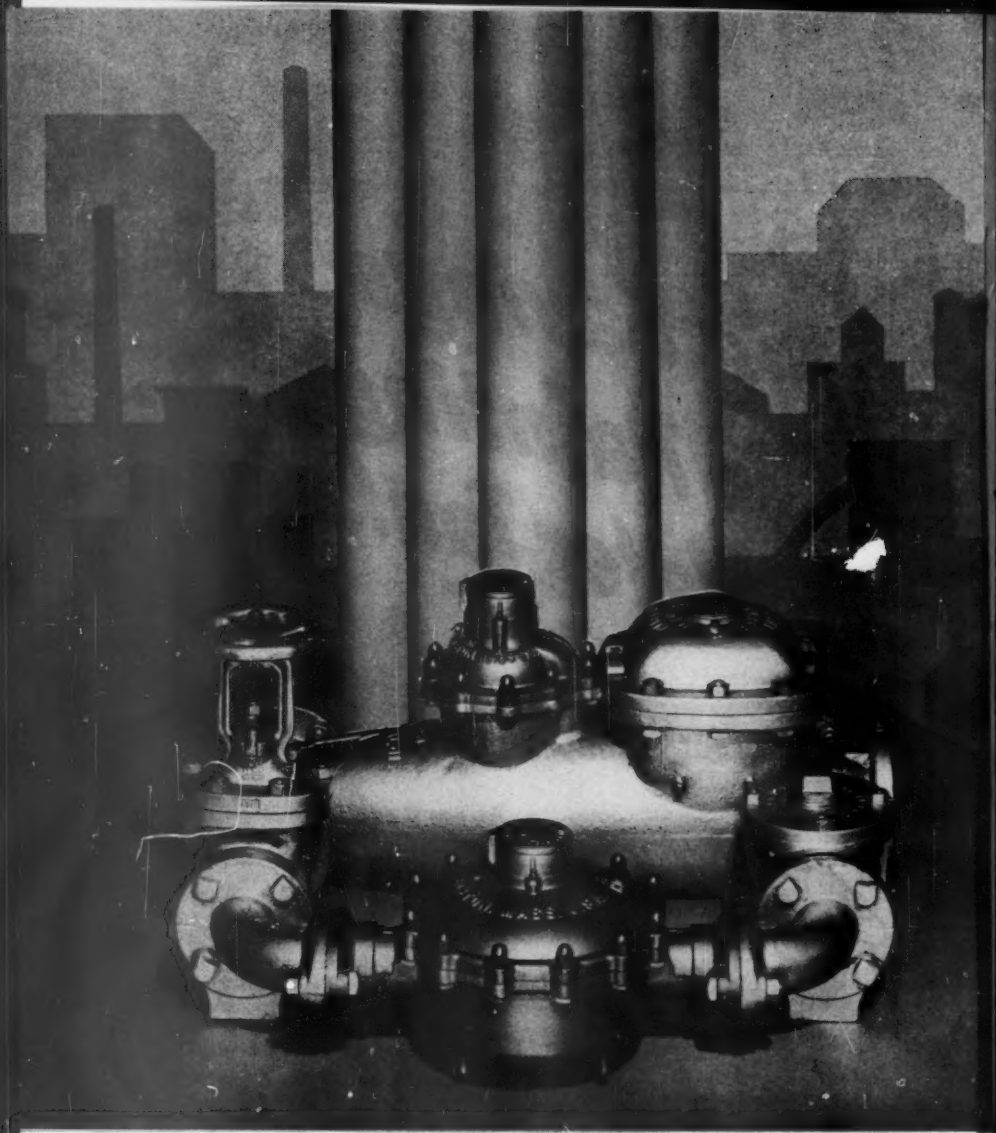

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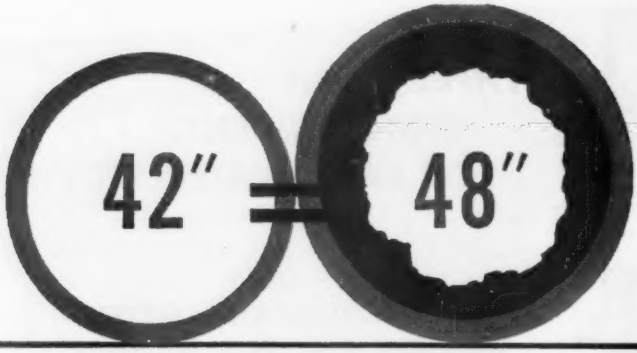

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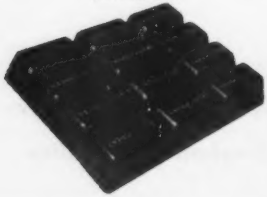

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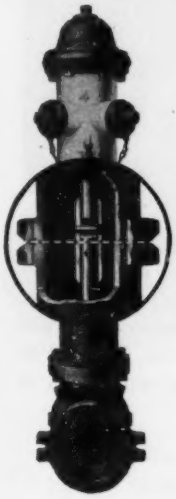

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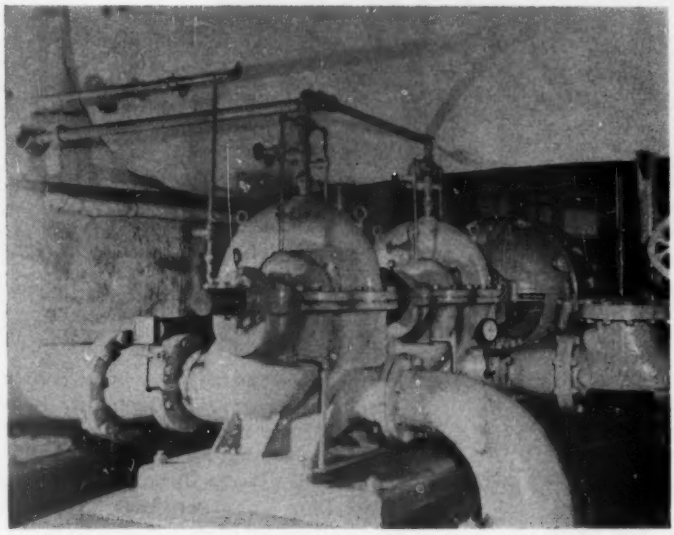

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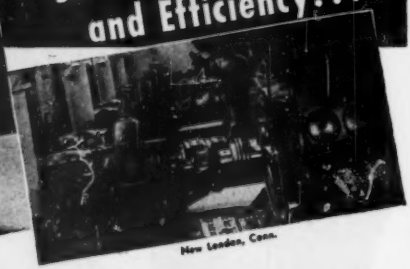
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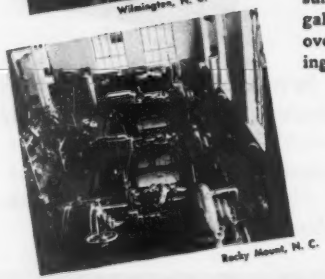
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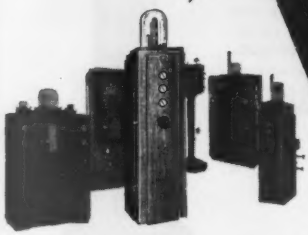

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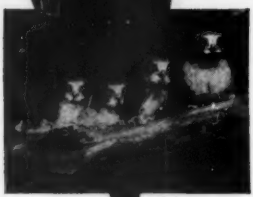

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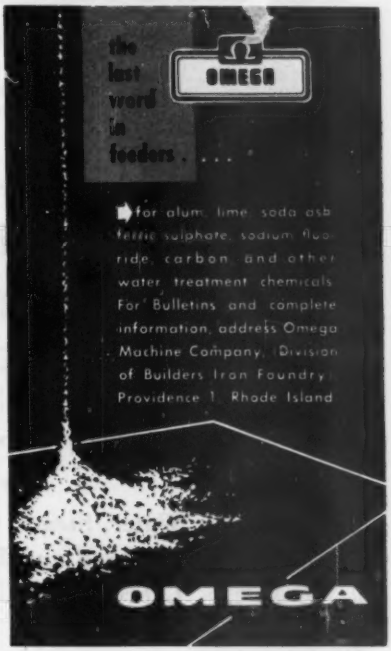
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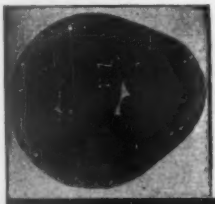

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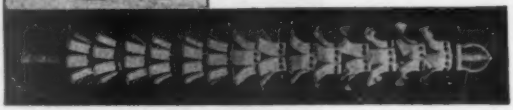

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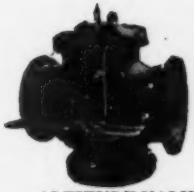

Controls elevation of water in tanks, basins and reservoirs

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Maintains desired discharge pressure regardless of change in rate of flow

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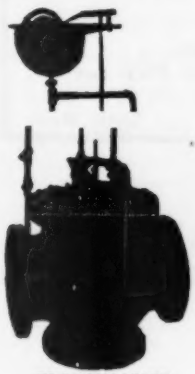
Regulates pressures in gravity and pump systems; between reservoirs and zones of different pressures, etc.



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Combination automatic control both directions through the valve.

Maintains safe operating pressures for conduits, distribution and pump discharge

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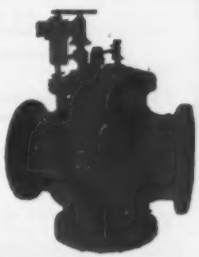
Electric remote control—solenoid or motor can be furnished



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Welded Standpipe

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Such records of performance and repeat orders cannot be accidental. They are due to the fact that all Rensselaer products are over-safe, both as to generous amounts of materials in the right places, and the incorporation of design features which insure reliable performance years after the valves are installed.

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Rensselaer VALVE COMPANY, TROY, N. Y.

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HI PRESSURE LUG compounds full pressure of bolt to compress the gasket around the pipe. This prevents bending, assures "first try" success!

RUBBER SEAL has large matched teeth that intermesh easily, provide perfect seal against leakage.

WRITE TODAY *for fully illustrated catalog in color which gives specifications, prices and complete information about CirclSeal Clamps and HiPressure Leak Repair Clamps!*

Construction: 36 ounce heavy Copper or 20 gauge Stainless Steel sleeves; ½" CadPlated or Silicon-Bronze bolts; the new HiPressure Lug which eliminates bolt bending and holds higher line pressures; special intertoothed Lastite rubber gasket to insure constant gasket thickness on uneven pipe.

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Your HILCO SUPPLY man can demonstrate them ! !

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96%

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STILL IN SERVICE

We are stating a fact and you don't have to take our word for it. We refer you to one of the most important fa finding jobs ever undertaken by the water works industry — the recently completed survey of the service life of water works facilities. This survey was sponsored by three water works associations.

The survey shows that 96% of all the cast iron water mains ever laid by 25 representative cities in sizes 6-inch and larger *are still in service.*

A detailed report of the survey has recently been published by the American Water Works Association. We have reprinted, by permission, the facts pertaining to cast iron water mains in a brochure which will be sent on request. Write to Cast Iron Research Association, Thomas F. Wolfe, Managing Director, 122 South Michigan Ave., Chicago 3, Ill.

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CAST IRON PIPE SERVES FOR CENTURIES

Barbara Fritchie's house in Frederick, Maryland as it appeared in the year 1866

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cast iron
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FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

NUMBER NINE OF A SERIES

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is a quarterly publication, containing the papers read at the meetings, together with reports of the discussions. Many of the contributions are from writers of the highest standing in their profession. It affords a convenient medium for the interchange of information and experience between the members, who are so widely separated as to find frequent meetings an impossibility. Its success has more than met the expectation of its projectors; there is a large and increasing demand for its issues, and every addition to its subscription list is a material aid in extending its field of usefulness.

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Another point, LEADITE saves "interest charges" by speeding up the completion of the water line.

The true value of LEADITE is best indicated by the fact that it has been used on THOUSANDS OF MILES of Water Mains,—all over this Country, as well as in many Overseas Countries.

The Pioneer self-caulking material for c. i. pipe,
Tested and used for over 40 years,
Saves at least 75%.

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